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NUMBER 6

FOOD INDUSTRIES

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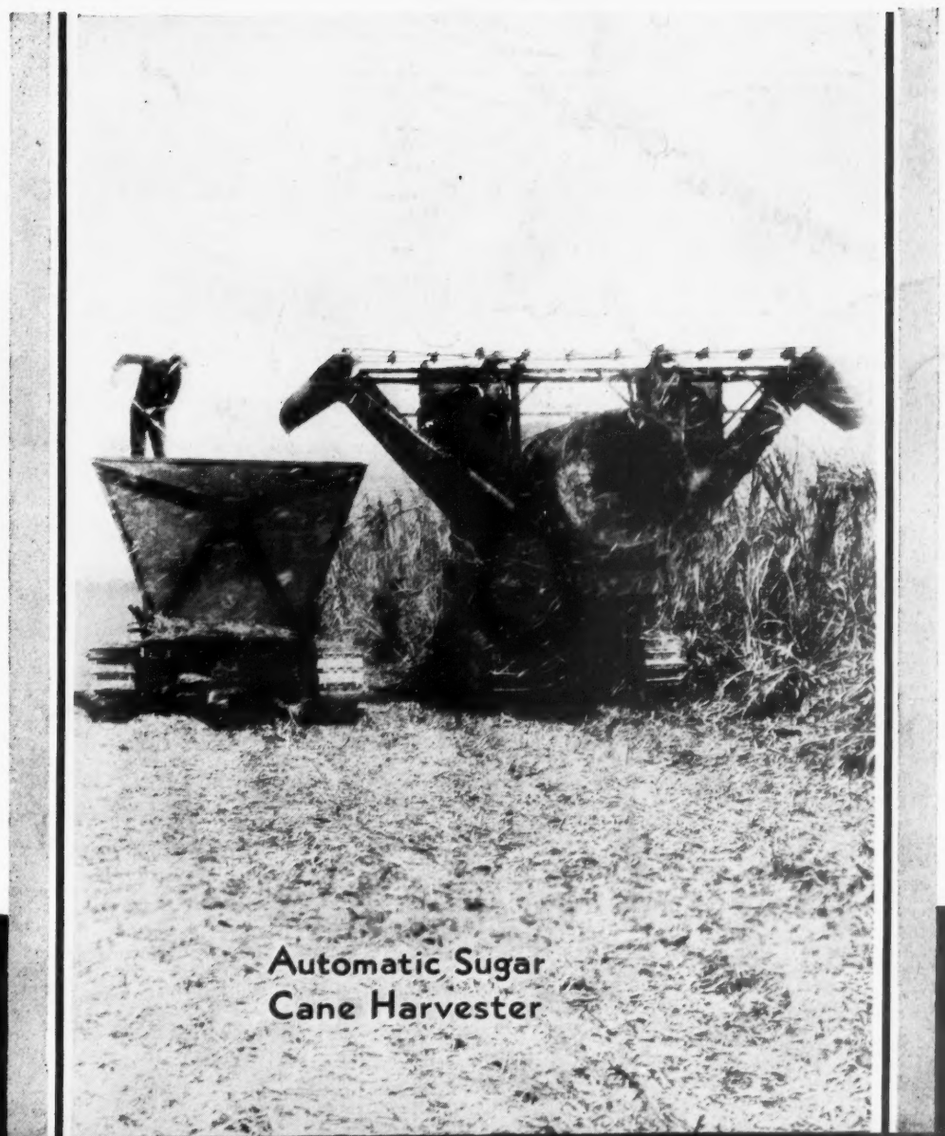

Automatic Sugar
Cane Harvester

JUNE
1931

Air Conditioning in Bakeries
Cartridge Refrigeration
Making Corn Oil

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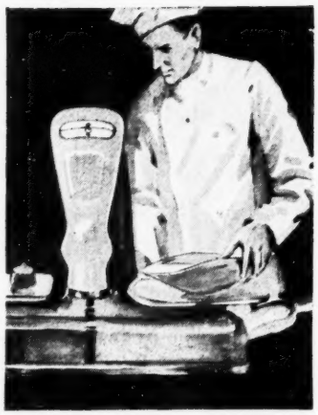


● Baking is but one of the many branches of the food industry in which Diamond Crystal Salt has opened the way to greater success. We should be glad to send you detailed information regarding the selection of the salt best suited to your own product

He thought he'd measured out 16 lbs. of salt . . . but that's not what the dough received

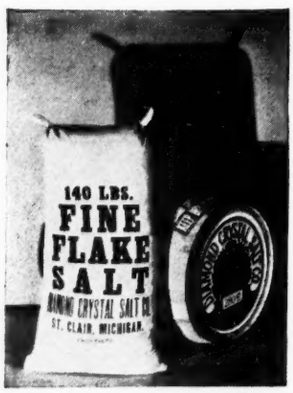
A MID-WESTERN baker had purchased his bread formula from a famous and expensive baking consultant. Every day his foreman measured out the specified quantities of flour, water, yeast, and salt. And still the bread was lumpy; blemished with holes; below standard in flavor.

A telegram summoned the consultant to visit the bakery and investigate. He found that although the formula had apparently been followed, in reality it had not been. The formula had called for 16 lbs. of salt, and the foreman had been weighing out what he thought was 16 lbs., but actually a lesser amount of salt had been going into the dough.

The remainder was impurities. And so the insufficient amount of salt had not been enough to regulate the yeast action and prevent the holes that come from bursting of bread cells. The impurities, on the other hand, had made the bread flavor bitter and unappetizing.

When the bakery changed to pure salt, Diamond Crystal Salt, the bread immediately showed vast improvement. The texture became fine and even and free from holes; richer flavor was developed.

Why not make a trial, in your own bakery, of this pure, flaked salt that is made by the exclusive Alberger process? Why not give it a chance to prove to your own satisfaction the improvement which *pure* salt can make in bread? Diamond Crystal Salt Company, (Inc.). *Bulk Department*, 250 Park Ave., New York.



Year in, year out, Diamond Crystal Salt averages 99.9% pure—or better

DIAMOND CRYSTAL SALT

A PRODUCT OF GENERAL FOODS CORPORATION

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VOLUME 3

FOOD INDUSTRIES

NUMBER 6

The Journal Devoted to the Problems of the Food Manufacturer

Contents for June, 1931

Overcoming Climatic Handicaps by Air Conditioning 240
By EARL D. STEWART

Cartridge Refrigeration as Used by an Ice Cream and Milk Distributor ... 244
By K. W. RANNEY

More Miles for Truck Tires 248
By L. W. FOX

Conveyors Aid Mass Production of Pretzels 249
By J. B. NEALEY

Making Salad Oil From Corn 251
By MAURICE M. DURKEE

Rigid Plant Routine Controls Fungus Growths 255
By J. H. RICHARDSON

Some Trends in Distribution Organization and Method 259
By F. P. VALENTINE

The Wage Earner in the Food Industries 261
By EDWARD R. DEWEY

Retaining Vitamins in Tomato Juice Manufacture 263
By E. F. KOHMAN

Canning Tests Prove Presence of Thermophiles in Sugar 265
By E. J. CAMERON AND J. YESAIR

Corrosion of Tin-Plate Containers 266
By E. F. KOHMAN

Editorials 237	**Patent Digest** 270	**Trade Notes** 278
Book Reviews 267	**New Equipment** 271	**Personals** 278
Government Publications 268	**Manufacturers' Catalogs** 272	**Obituary** 279
Current Literature 269	**News of the Month**.... 273	**New Construction** 279

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To fill the nation's sugar bowl—

Uncle Sam has a sweet tooth—so sweet, in fact, that refining sugar to satisfy it is one of the country's major industries.

From the country's leading refineries a constant flow of packages pours in a steady stream into forty million homes. Quite as important as refining the sugar is the problem of packaging it—strong enough to keep it sweet and pure from refinery to table, fast enough to keep pace with production, accurately to give correct measure and avoid waste.

Sugar's leading producers, just like those in practically every packaging industry, have found Pneumatic Scale Packaging Machinery the best method of performing their packaging operations. In fact, practically *all* of the sugar refineries in the United States use Pneumatic Scale Packaging Machines. They have tested costs, performance, depreciation — all the things you must consider when you contemplate buying packaging machinery. The results of their experiences are contained in a booklet, entitled, "An Interview," a booklet that should prove an invaluable guide to you in your selection of a packaging method. Write for a copy.

PNEUMATIC MACHINES

Carton Feeders—Bottom Sealers—Lining Machines—Weighing Machines (Net and Gross)—Top Sealers—Wrapping Machines (Tight and Wax)—Capping Machines—Labeling Machines—Vacuum Filling Machines (for liquids or semi-liquids)—Automatic Capping Machines—Automatic Cap Feeding Machines—Tea Ball Machines

PNEUMATIC SCALE
PACKAGING MACHINERY

PNEUMATIC SCALE CORP., LTD., NORFOLK DOWNS, MASS.

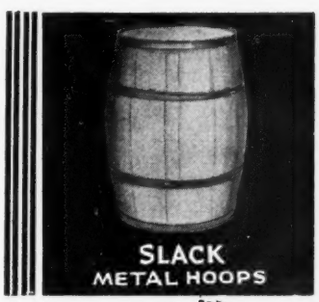
Branch Offices in New York, 26 Cortlandt St.; Chicago, 360 North Michigan Ave.; San Francisco, 320 Market St.; Melbourne, Victoria; Sydney, N. S. W., and Trafalgar House, No. 9 Whitehall, London, England.

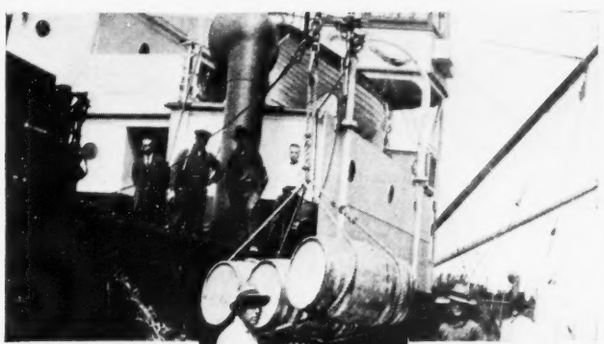
WATERPROOF

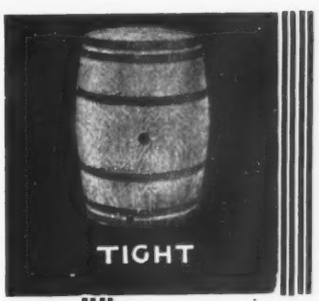
Water cannot damage products shipped in barrels. They are impervious to moisture, and have a natural defense against this element. •When wood becomes moist it expands. As the staves of a barrel are tightly bound in place by hoops, any expansion that takes place must seal the joints just so much tighter. •When water is applied to a barrel whether in the form of excessive humidity, precipitation, or accidental exposure, the barrel automatically tightens to protect its contents. •Wooden Barrels, with their high resale value, are economical containers for many Food and Chemical products, liquid or dry. Write the Associated Cooperage Industries for the Wooden Barrel Booklet.

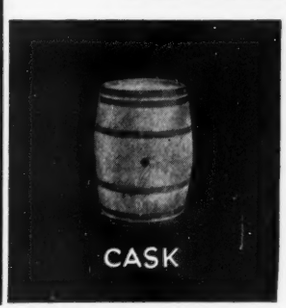
ASSOCIATED COOPERAGE INDUSTRIES OF AMERICA

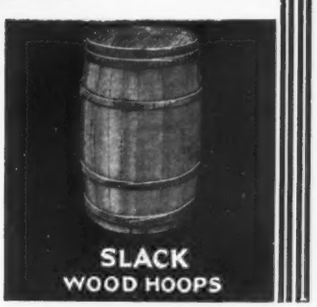
Railway Exchange Building — St. Louis, Missouri











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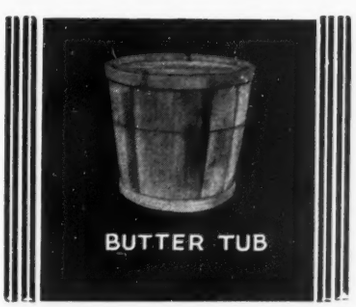


Making It Easier for Advertisers to Buy and Use *Street Car Advertising*

OUR new sales plan is now in effect. It permits the advertiser for the first time to buy and use Street Car advertising on a basis that is unlimited in its flexibility.

Previously, Street Car advertising has been sold only on full or half service contracts for one year's showing with short rate charges for six months' contracts.

Our new method allows the advertiser to spend exactly to the dollar what *he* wants to spend in the different cities. We have adopted the rate method of many leading newspapers —the only difference is that instead of buying so many lines of space to be used within one year, the advertiser buys a definite number of car card displays at so much per card per month to be used when, where and to the extent desired within one year.

The seasonable advertiser or the advertiser who has a special short time campaign may contract for a definite number of car card displays for one year and accelerate his service as desired.

For example, the rate for 5,000 cards monthly for one year would be the same whether the service is used within six months by the display of 10,000 cards, or within four months by the display of 15,000 cards, or within three months by the display of 20,000 cards, or within two months by the display of 30,000 cards.

One lapse is permitted without extra charge— as an example, continuous service during March, April and May and during September, October and November.

There are three very important reasons why this new sales plan will greatly benefit the advertiser who wants to advertise *only* where he has distribution and *only* to the extent that his sales in each market justify—

***First,* because he will select cities where the conditions are most favorable for him.**

***Second,* because he will have the satisfaction of knowing that he is not spending money for advertising that reaches people who live in cities, towns and villages where his product is not on sale or in places where his sales are very light.**

***Third,* because *he* will figure the expenditure for each market and get the cost down to exactly the amount justified by the sales and conditions of the different markets.**

DAILY COST— less than $150

Here is an example of how the 5,000 cards could be distributed at a monthly cost of $4,400:

	CARDS DISPLAYED
Pittsburgh	500
Harrisburg	50
Reading	50
Scranton	50
Cleveland	500
Cincinnati	350
Columbus	100
Toledo	100
Dayton	75
Youngstown	50
Bronx, N. Y.	250
Buffalo	250
Rochester	150
Syracuse	50
Binghamton	50
Baltimore	400
Washington	300
Atlanta	100
Birmingham	100
San Francisco	400
Louisville	200
St. Louis	500
Omaha	100
Dallas	100
Ft. Worth	75
Memphis	75
Nashville	75
(5% Excess Display Guaranteed)	5,000

The average Street Car of the United States *now* carries more than 17,000 passengers monthly.

On that basis, 5,000 cars in these 27 cities carry more than 85,000,000 passengers every month.

This figures 100,000 circulation for every $5.

Street Car advertising circulation is the lowest cost, definitely known circulation in existence.

Sales have declined in nearly all lines of business, and like all other advertising mediums, we are below normal.

NOW—in order to help ourselves, we have figured out this plan of helping advertisers by giving them the privilege of using Street Car advertising in any way that will be of the greatest help to them.

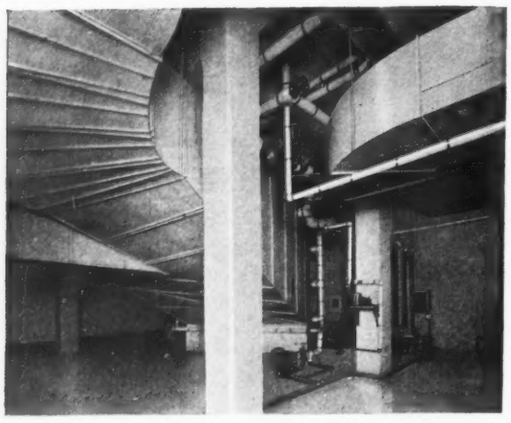
H. C. Barnard

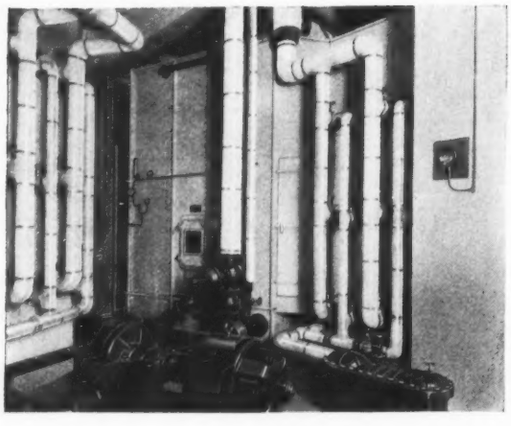
National Advertising Manager.

STREET RAILWAYS ADVERTISING CO., 220 W. 42nd ST., NEW YORK, N. Y.

(Offices in All Large Cities)

—for "all-year comfort" in food plants—





"Buffalo"

Air Conditioning Apparatus is the Logical Choice

In storage plants, packing plants, refrigerating plants—for every type of service—heating, ventilating, drying, conveying, reclaiming — Buffalo Equipment is specified by an ever-increasing number of food plant engineers.

Unusual and difficult heating and ventilating problems are being successfully handled by Buffalo equipment throughout the food industry.

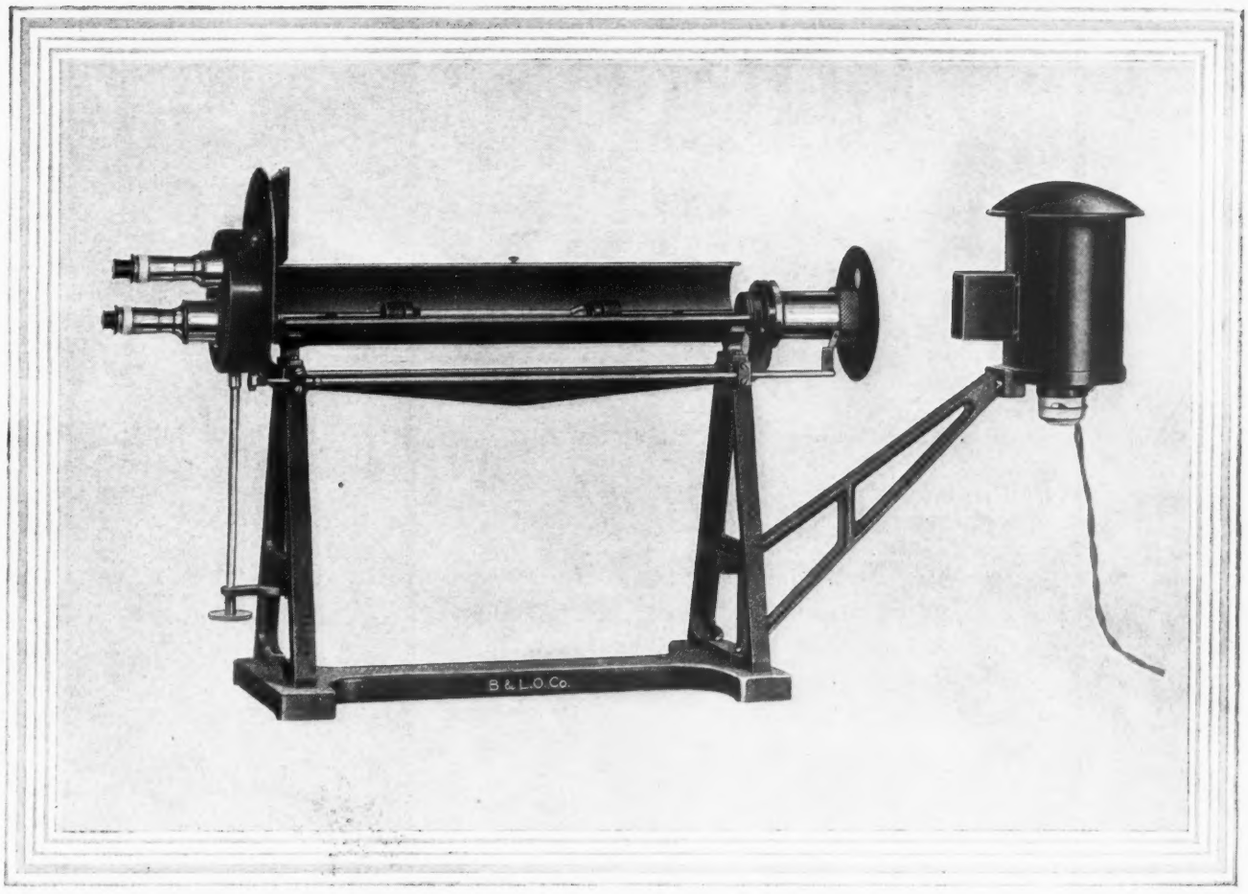
The next time you are in the market for air conditioning apparatus call on Buffalo engineers. More than fifty years' experience guarantees results at low operating costs.

Branch engineering offices in all principal cities.

Buffalo Forge Company

181 Mortimer St., Buffalo, N. Y.

In Canada: CANADIAN BLOWER & FORGE CO., LTD., KITCHENER, ONTARIO



Stop Buying Sugar Blindfolded

THE economical way to buy sugar is to specify the percentage you require. You can be sure that you receive the true percentage you ordered if your chemists check up with a B & L Saccharimeter. It doesn't pay to take chances. You would save more than the price of the instrument in the detection of one large shipment of sugar below your specifications.

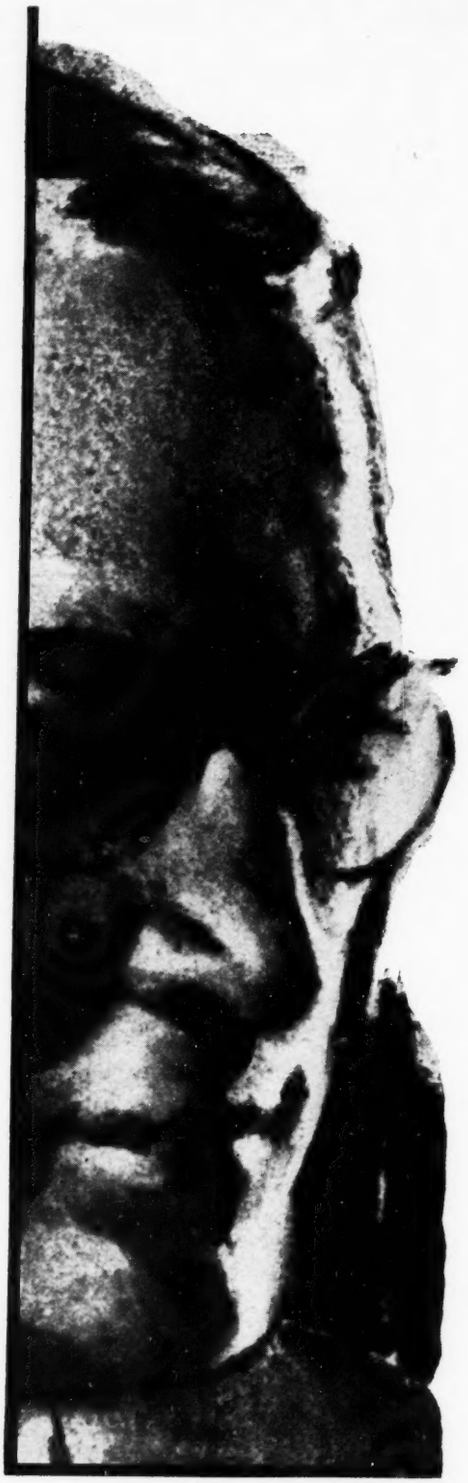
This Saccharimeter was designed only after careful consideration of the suggestions and specifications of a large number of sugar and food chemists in this and other countries. It is a simple instrument of sturdy construction, in which are embodied those features most essential to accuracy, ease and convenience of manipulation. Control your sugar purchases with the Saccharimeter and save money. Write today for a complete description. BAUSCH & LOMB OPTICAL CO., 603 St. Paul Street, Rochester, N. Y.

BAUSCH & LOMB

MAKERS OF ORTHOGON EYEGLASS LENSES FOR BETTER VISION

There's an army

behind the Outposts!



LOCATED in most all of the cities and larger towns throughout the country are Kelvinator Refrigeration Engineers.

Behind them, at Detroit, is the Kelvinator Engineering Corps—and the oldest and most productive experience in electric refrigeration.

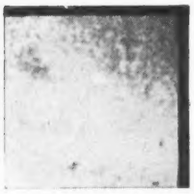
Behind the outposts, there is an army—an army of experience—an army of data that has accumulated through seventeen years devoted to research, experimentation, and the perfecting of electric refrigeration in all its phases.

This data and experience are available to any food manufacturer who is interested in better refrigeration for less money.

Manufacturers are invited to communicate with the Kelvinator Refrigeration Engineer in their cities, or, to come direct to Refrigeration Headquarters with their refrigeration problems. (298)

KELVINATOR CORPORATION
14271 Plymouth Road, Detroit, Michigan
Kelvinator of Canada, Ltd., London, Ont.
Kelvinator Limited, London, England

Kelvinator



C O U P O N

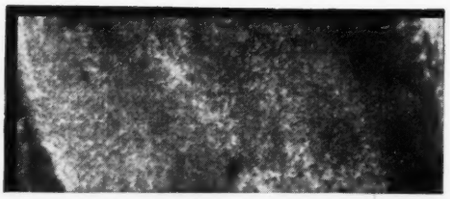
Kelvinator Corp., 14271 Plymouth Rd., Detroit, Mich.

Gentlemen: Please send information about your new Cross Fin Coil. Also the name of the Kelvinator Refrigeration Engineer in my city.
☐ Yes ☐ No.

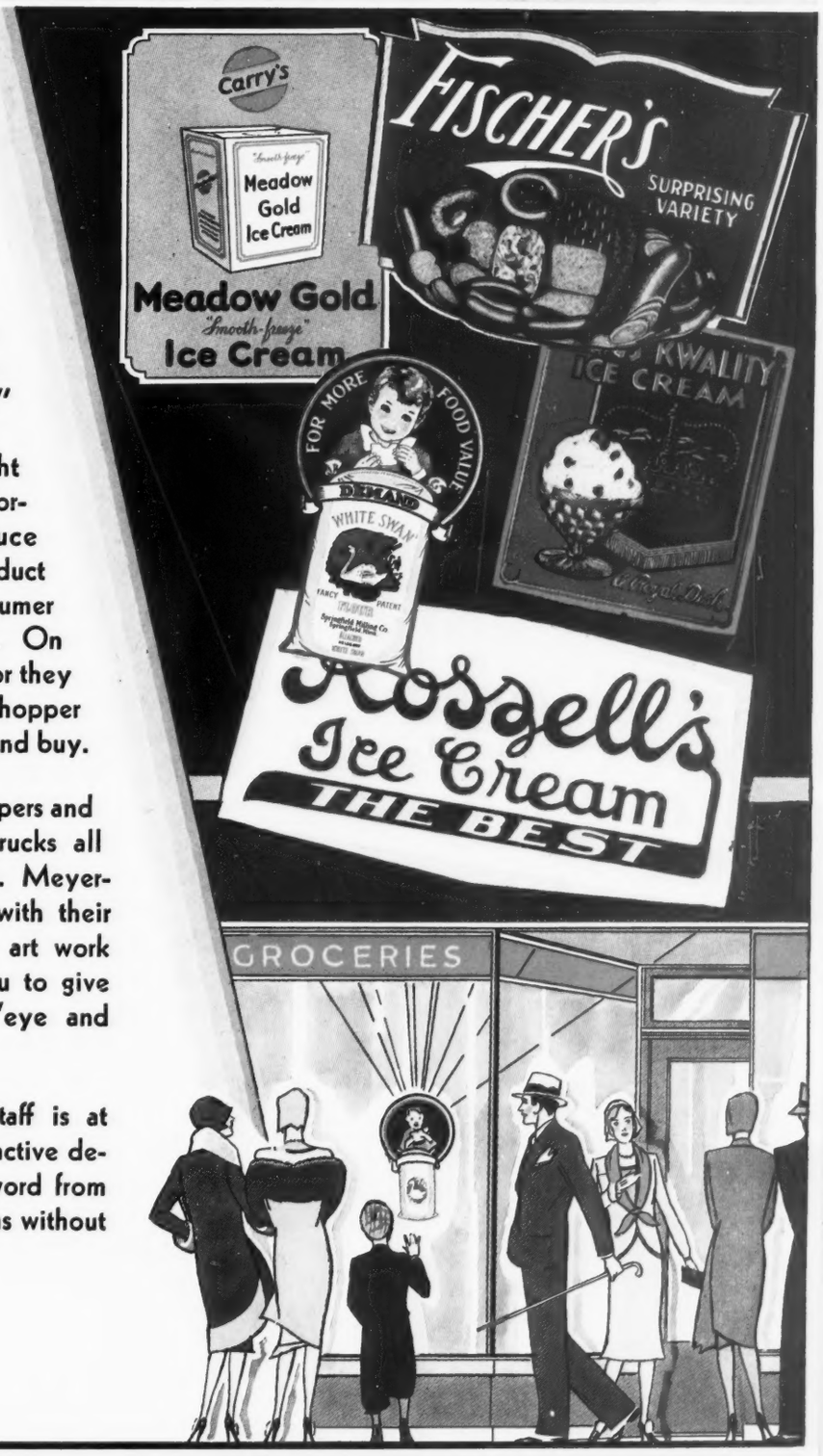
*Name*_____

*Street Address*_____

*City*_____ *State*_____



Stop Signals for Shoppers



Sight buying has replaced the old "feel and taste" method. And beauty and color are the new factors in creating today's "best seller."

Meyercord Day-and-Night signs salute the eye with colorful suggestions that produce sales. They bring your product to the attention of the consumer at the moment of selection. On your dealer's window or door they serve as stop signals to the shopper and an invitation to come in and buy.

Cartons and containers, wrappers and packages, billboards and trucks all make their appeal to the eye. Meyercord Day-and-Night signs with their unlimited range in beauty, art work and design, will enable you to give your dealer's store new "eye and sales" appeal.

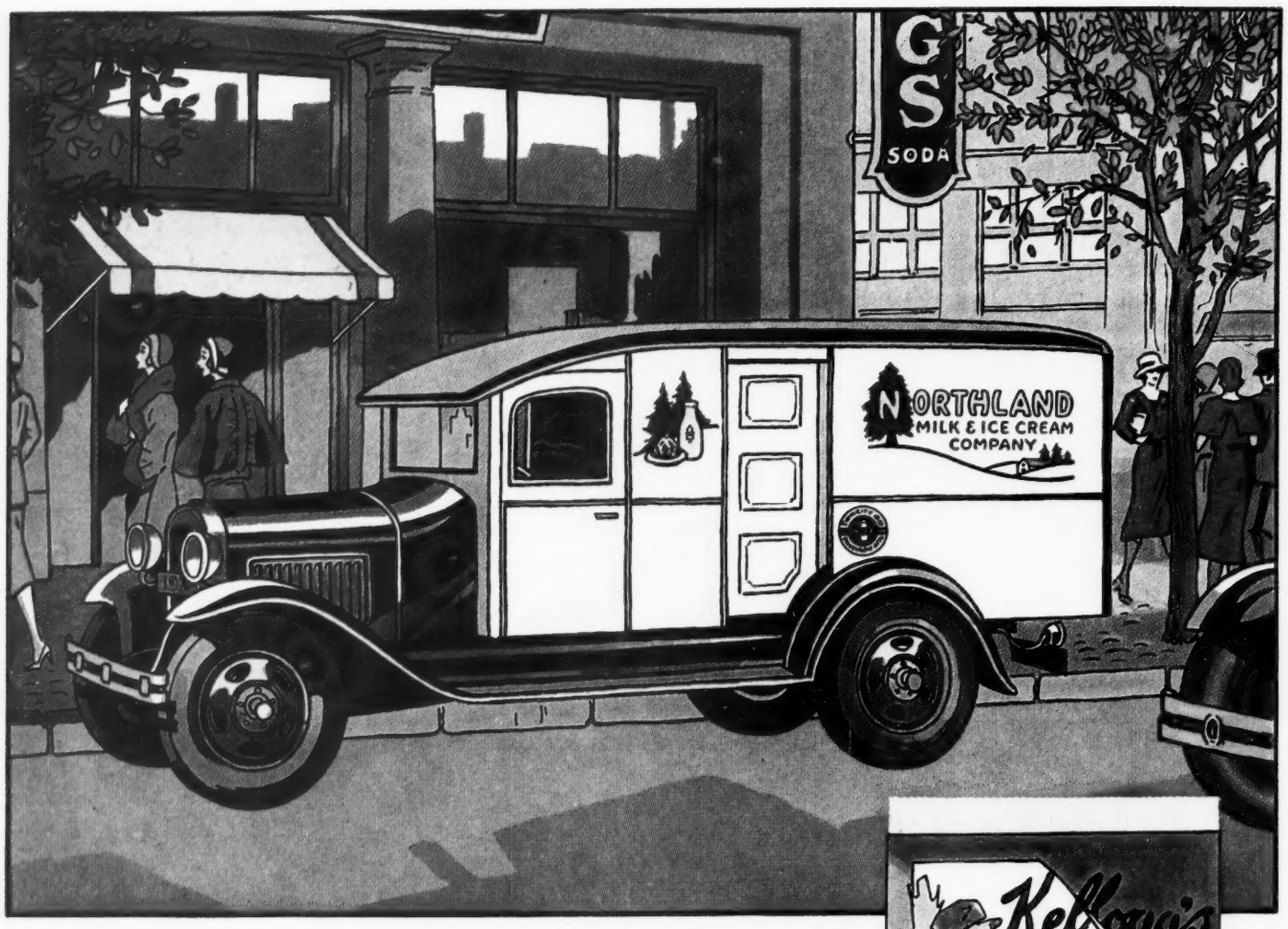
The Meyercord Creative Staff is at your service to make up attractive designs and suggestions. A word from you will bring new sales ideas without cost or obligation.

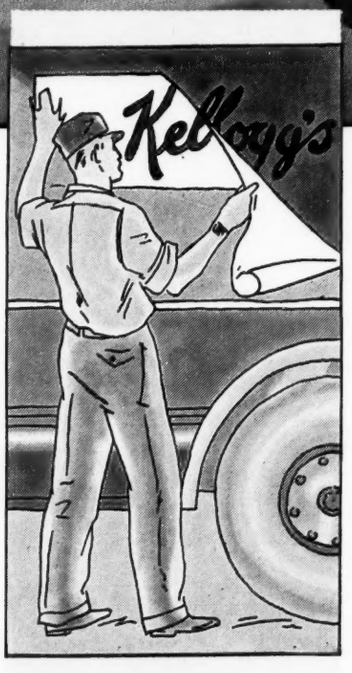
MEYERCORD WINDOW SIGNS

COLORFUL DAY AND NIGHT ADVERTISEMENTS

120 SO. LA SALLE ST. . . . . CHICAGO, ILLINOIS

The Talk of the Neighborhood





The impression made by your delivery trucks on the community is directly reflected in your sales volume. Poorly painted and poorly decorated vehicles are like poorly dressed men. They may be able to deliver the goods but their opportunities are limited.

On the contrary, well-painted, colorful trucks displaying your trademark in full color with attractive Meyercord transfers will be seen by thousands and create an impression of prosperous business. Housewives and dealers prefer patronizing firms whose equipment reflects the quality of the merchandise.

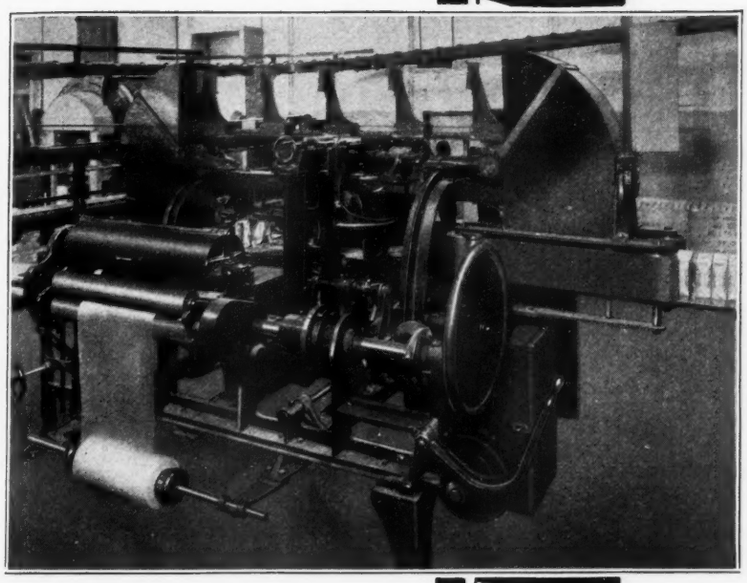
Meyercord truck transfers permit fleet owners to keep their equipment distinctive and attractive at a minimum expense. Delivery trucks decorated with Meyercord Weather-Tested signs soon become the talk of the neighborhood. A competent Creative Staff will gladly help you give your equipment new and effective advertising appeal. No cost or obligation.

MEYERCORD WEATHER-TESTED TRANSFERS

MORE ECONOMICAL THAN HAND PAINTING — MORE ENDURING THAN THE SURFACE

TRANSPORTATION DIVISION — THE MEYERCORD CO., 120 S. LA SALLE ST., CHICAGO

PACKOMATIC MACHINERY *wins new users* EVERY MONTH



Packomatic Wax Wrapper installation at The American Products Company, Cincinnati, manufacturers of 400 different household products, sold in 48 states under the nationally known trade name ZANOL.

You may be amazed to find that your present method of handling and sealing cartons and shipping containers is costing each year more than would automatic equipment. Why not make that additional profit?

Packomatic machinery is simple in construction and operation which means lower maintenance costs. It is easily and rapidly adjustable or convertible for various sizes of cartons and shipping cases.

Write — Wire or Phone For a Packomatic Engineer. Any time — any place — No obligations.

WRITE FOR NEW CATALOG

FERGUSON JFo NATIONAL

A FEW PACKOMATIC USERS

The Quaker Oats Company
Canada Dry Ginger Ale, Inc.
George A. Hormel Company
Lavoris Chemical Company
Maxwell House Products Co.
Ohio Salt Company
Thomas J. Webb Company
Procter & Gamble Company
The Sanitary Grocery Co.
The Carnation Company
The Postum Company
The Cream of Wheat Corp.
The Pepsodent Company
National Biscuit Company
The Diamond Crystal Co.

PACKOMATIC
PACKAGING MACHINERY

J. L. FERGUSON COMPANY, JOLIET, ILLINOIS

Branch Offices: NEW YORK ST. LOUIS LOS ANGELES

Built for Service

STRONG AND DEPENDABLE, Standard Conveyors are designed to meet modern demands

Standard Conveyors have demonstrated their great value in hundreds of food plants. They are designed to speed up material handling and break the jam of congestion on the floors and shipping platforms.

Standard Conveyors are built by experienced material-handling engineers to stay in service even under the most severe operating conditions. Every detail of construction has been carefully studied to avoid breakdowns. The characteristic weaknesses of this type of equipment has been foreseen and guarded against, in an effort to make Standard Conveyors as nearly trouble-proof as possible.

Reliable Conveyor Counsel is available to you at any of the Standard branches listed below.

STANDARD
CONVEYOR COMPANY

NORTH SAINT PAUL, MINNESOTA

ATLANTA, 712 Flatiron Bldg.
BALTIMORE, 15 W. Franklin St.
BEAUMONT, Post Office Box 402.
BIRMINGHAM, 1202 Martin Bldg.
BOSTON, 755 Boylston St.
BRIDGEPORT, 406 Court Exch. Building
BUFFALO, 908 Ellicott Square
BUTTE, 51 E. Broadway
CHICAGO, 400 W. Madison St.
CINCINNATI, 1106 Ingalls Bldg.
CLEVELAND, 5005 Euclid Ave.
DENVER, 1420 Sixteenth St.
DETROIT, 420 U. S. Mortgage Building
EVANSVILLE, 20 Furniture Bldg.
FORT WAYNE, 816 Kinnaird Ave.
GRAND RAPIDS, 533 Michigan Trust Building
HARRISBURG, Post Office Box 83.
JACKSONVILLE, 21 N. Ocean St.
KANSAS CITY, 1321 Union Ave.
MILWAUKEE, 594 E. Water St.
NASHVILLE, 178 Eighth Ave., No.
NEW ORLEANS, 1003 Magazine St.
NEW YORK CITY, 461 Eighth Ave.
OMAHA, 1124 Harney St.
PEORIA, 1303 Peoria Life Bldg.
PHILADELPHIA, 1541 Spring Garden Building
PHOENIX, Post Office Box 145.
PORTLAND, 53 First Ave.
PITTSBURGH, 1517 Clark Bldg.
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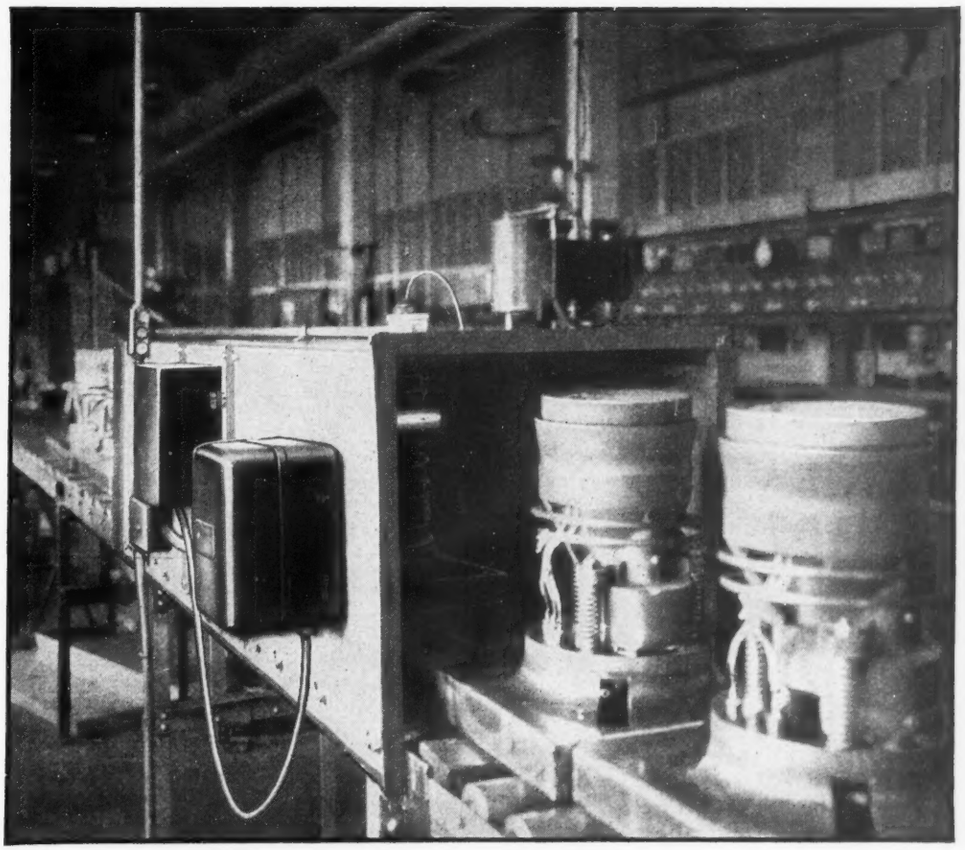

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And here's the total, precise and unquestioned, registered at the very elbow of the production supervisor

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WITH canned peas, flavor and quality mean everything to the housewife. And this year, due to widespread publicity given to the new standards, both will come into even greater prominence. Naturally, women are going to be more discriminating than ever—they are going to look for even better flavor, better quality in this year's pack of canned peas. When they do find canned peas that meet their own ideas of what fine canned peas should be, from that day on canned peas will grace their daily menus to an ever increasing extent.

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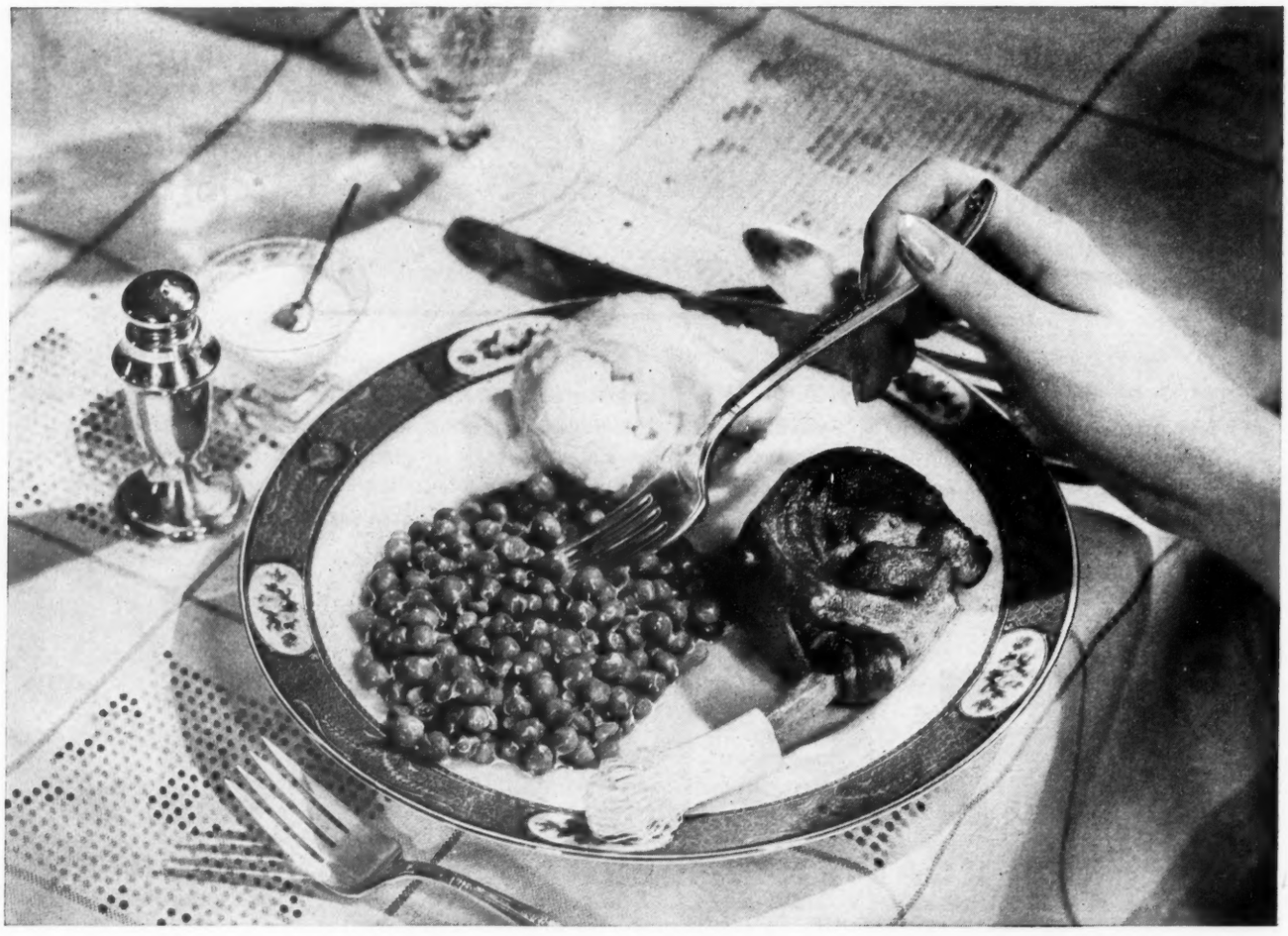

FOOD INDUSTRIES

The Journal Devoted to the Problems of the Food Manufacturer

Volume 3.....A McGraw-Hill Publication—Established 1928.....Number 6

NEW YORK, JUNE, 1931

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Laurence V. Burton, Editor

Looking to the Future

COMPLETE ELIMINATION of business cycles probably is out of the question at any time in the future, but with proper intelligence in business guidance the amplitude of the swings should be lessened in their violence. The human race may even learn to enjoy major depressions as much as it now enjoys the weekly business depression which we call Sunday.

FOR THE PURPOSES of control of the future, economic data are needed that are not now available. Various economic experts have told us that these data would be well-nigh impossible to obtain, yet our conviction is that the future conduct of business along less gyratory lines will require: (1) a knowledge of the present overcapacity of every industry by nation and by region; and (2) a knowledge of what is the optimum degree of overcapacity for an industry.

WITH INFORMATION of this nature available to all who need it, particularly to bankers, who, after all, are in an admirable position to exercise control, we can expect less fantastic extremes than now exist. Accurate knowledge should be a safeguard against overexploitation.

HERE ARE SAMPLES of what we ought to know about every industry all the time. According to Earl D. Babst, sugar refining capacity in the United States is now 71 per cent greater than our domestic needs. A year ago the glass container industry was reported 61 per cent overbuilt. The boxboard industry has a surplus production capacity of 20 to 25 per cent; cement in 1929 had 34 per cent of its equipment idle; cotton oil has 50 to 60 per cent overcapacity in oil-pressing plants; lumber has a mill capacity of 50 per cent in excess of demand; and in 1930 only 67 per cent of the rated capacity of petroleum oil refineries was utilized.

WE ASK FRANKLY: is this a healthy condition? Do the corporations in those industries reflect a healthy condition in their earnings?

STABILIZATION of future business growth is one of the general objectives outlined on page 2 of the Platform for American Business suggested by the McGraw-Hill Publishing Company in a supplement to February *Food Industries*. We have chosen to discuss the broadest view of this objective, and the final suggestion is made that, lacking the data postulated here as necessary, bankers, manufacturers, and promoters should determine it in each case before adding further overcapacity to existing overdeveloped industries.

New Agricultural Practice Introduces New Plant Problems

LOW prices prevailing for sugar have forced producers of cane sugar to find ways of cutting costs, and the development of the harvesting machine shown on the front cover of this issue of FOOD INDUSTRIES is one of the results. One cane harvester, working twenty-four hours per day, will do the work of two hundred men, and if this were the end of the story, it should be responsible for a marked reduction in harvesting costs, for the machine can cut and strip one hundred and fifty tons of cane in this period of time, barring accidents.

Unfortunately, however, the use of the machine has introduced a whole new set of problems at the mill which, until solved, will be of sufficient magnitude to offset temporarily at least, most of the savings that can be effected in the field. Insufficient time has elapsed for the solution of the new problems in such a way that the combined operation of mill and harvesters will be efficient and economical. However, the problems which have developed in the plant as a result of improved agriculture are interesting and closely paralleled by problems in canning, meat packing, and fishing.

Briefly, the mill seems to be able to grind less of the short, machine-cut cane than long cane harvested by hand. More mud comes in with the machine-cut cane, although it is probable that much of this is traceable to the fact that the cane is planted on furrowed instead of on level land. Juice from the machine-harvested cane is distinctly acid, requires additional liming, and this in turn causes reduced efficiency, due to scaling of the tubes in the evaporators. Furthermore, the sugar yield seems to be lowered as a result of machine harvesting.

The mud problem seems to be purely one of proper planting and cultivation, but the acid condition of the juice and the lower sugar yield are more serious. In passing through the harvester the cane is very roughly handled and bruised. Its effect here seems to be as deleterious as that found in the rough handling of fish and meats, for bruises set up local enzyme action and also may make possible a wholesale infection with bacteria. After harvesting the cane a period of twenty-four or more hours elapses before it reaches the mill, during which it is closely packed in dump cars to a depth of six feet or more.

Under these conditions it is hardly possible for the juice in exposed cut surfaces to do else but begin an acid fermentation, or for metabolic changes in the bruised cane to start, and the only remedy seems to be to hasten the shipment from field to mill, so that grinding can begin before the bacteria and enzymes can gain much headway. But this is contrary to the traditional policy of sugar grinders, who require as much as a ten-day supply of cane in the mill yard to prevent delays due to weather. Nevertheless, the potential cost savings should justify considerable speeding up of transportation. And in this day of trouble, success will come by daring and doing.

Canners of sweet corn also suffer from sugar deterioration when delays occur between the fields and actual canning, which bring about an impairment of quality no less serious than the loss of sugar yield in the machine-cut sugar cane. Canners solve the problem by speeding up operations, mud and high water notwithstanding, and sugar mills can do likewise if it is necessary. Of course, the corn does not suffer from bruising and cutting like the sugar cane, but, on the other hand, if the canner were to allow his raw material to lie for as little as eighteen hours after cutting he would most certainly have very inferior corn.

Needed: A Broader Vision

TO study the addresses before the International Chamber of Commerce, particularly those of E. Van Rompa, of the Belgian Grains & Produce Company, of Antwerp; or of Senator Giuseppe de Michelis, president of the International Institute of Agriculture, at Rome; or of Dean H. L. Russell, of the University of Wisconsin, is to realize that, although the problem of the individual man in getting enough to eat is of decreasing relative importance, the rôle of foodstuffs in world affairs is increasingly important.

Foodstuffs, particularly wheat, are a potent weapon in the hands of the Russian Soviet, and Mr. Van Rompa called upon all to prepare to resist the reckless and irresponsible policies of that nation. Dean Russell pointed out the already expressed opinions of leaders of thought that wheat as an export crop is no longer a possibility in this country under present conditions.

Despite the fact that no great program of economic progress came out of the congress or from the meeting of the U. S. Chamber of Commerce, a wealth of data was presented that shows clearly to any thinking person that American business must take a much broader viewpoint than ever before; that business men must develop a world vision, if they are to think clearly through their present troubles.

Success or failure of the Russian Five Year Plan will have a most far-reaching effect throughout the world. Business of all kinds must be ready for either eventuality. If the plan shall succeed we may look for much fiercer competition than we have ever known before. But if it fails we may look for something worse—conceivably a repudiation of the extensive credits that the Soviets have received. Business must study the world situation.

Industrial Comfort Through Air Conditioning

EXTREMES of climate are frequent in the so-called temperate zone, in which most of the world's population lives. Mankind endures, perhaps not cheerfully but at least tolerantly, arctic cold, desert heat and dryness. and tropical heat and humidity, when the other characteristics of the region permit him to wrest a living from it. Escape from cold has never been a particularly difficult problem, for extra clothing can always be worn and some sort of fuel usually is available, but escape from high temperature or low humidity heretofore has always been more difficult. Nowadays the residents of hot countries can achieve a high degree of comfort, in their working and living quarters at least, by the use of refrigeration and humidifying machinery.

As an example of overcoming adverse climatic conditions, the bakery described elsewhere in this issue is not unique but it well illustrates the advancement of this kind of engineering. The climate of the Imperial Valley must be endured to be really appreciated. Yet the high soil fertility of this bit of old sea bottom has attracted a large population engaged in growing melons, grapefruit, cotton, and vegetables.

The size of the population warranted the establishment of a large bakeshop, even though the climate did not. But the resources of modern refrigeration equipment over-

came the climatic obstacles, with the result that inside the walls of this plant the bakers work in an atmosphere of 80 deg. F., with a humidity which is comfortably moist, while the valley outside parches and sizzles in temperatures of from 100 to 125 deg. F. Eighty degrees is sometimes called summer heat and usually it is not considered cool, but in the Imperial Valley it is a delight.

Although the value of air conditioned and humidified to meet the need of a food manufacturing plant is not new, neither is it universally used. Meat packers have used it for some time in sausage-making and lard-packing departments. Many candy factories have found it of great value throughout the year in chocolate curing rooms. To a moderate degree the baking industry has used it in fermentation and proofing rooms. But to condition all the air inside the whole factory walls is still a little unusual. Possibly few plants will have to overcome the extremes of temperature in the manner accomplished by the Cramer Bakery at El Centro, California, but the results obtained there show what proper ventilation and refrigerating engineering can do when required and should be convincing evidence to those who are skeptical about the value of efficient air-conditioning equipment.

What Is an Adequate Sample?

A DICTIONARY defines "sample" as "a part shown to prove the quality of the whole; a representative part; a specimen," but very few analysts, whether they be chemists or bacteriologists, would waste much effort quibbling over just how a dictionary definition should read. Unfortunately, however, some seem to give no more attention to the significance of the term in its relation to their day's work than to the reading of the definition. Bacteriology and chemistry, both of which have become indispensable in the food industries for showing the presence of various substances and agents, require proper sampling before investigation in the laboratory. Thus we are accustomed to analytic figures showing the number of bacteria per cubic centimeter of water or milk, or the number of living cells in acidophilus cultures, the quantities of nitrogen in fertilizer, fats in milk, free fatty acids in edible oils, and the like.

All such applications depend, first of all, on the selection and preparation of the sample. But what is a sample and how shall it be prepared? How shall an analyst adequately sample a case of eggs, a carload of fertilizer, a tub of butter, a barrel of molasses? It is practically impossible to select adequate samples of some materials, although with others it may be easier.

Any dry substance disintegrated into fine particles may, perhaps, be sampled satisfactorily if proper time be taken to do it. The sample may be ground and reground, sifted and resifted, and successively reduced in volume, so that at the end of the process a representative specimen will be available for analysis. This procedure usually is the correct one for many chemical analyses of dry substances. However, the situation is less satisfactory for some foodstuffs. Few would argue that the data secured on the chemical or bacteriological examination of one egg indicate the condition of the other eggs in a case. How many eggs shall be taken, then, for analysis? Water bacteriologists have long realized that one satisfactory analysis does not justify giving a water supply a clean bill of health. On the contrary, they have virtually been forced to admit the impossibility of collecting water samples which are adequate for this purpose.

In this day of criticism one hears much from the individuals who are "checking" analytical methods. They divide into as many samples as necessary a certain quantity of a food product and send each sample to separate laboratories. They ask for certain determinations to be made, and when the results are tabulated the discrepancies may lead to long, illogical recommendations regarding analytical methods. Thus the technic and the analysts themselves must, without justice, carry the whole load. Seldom does it occur to these individuals that there may have been a variation in the sample. Furthermore, all laboratories are not equally proficient in analytical procedure. We seriously question the possibility of preparing really equivalent samples for chemical and bacteriological examination of, for instance, a tub or even a smaller quantity of butter.

A burden rests upon instructors in colleges who are teaching analytical methods, and they would do well to spend more time on this extremely important phase of analytical work. The difficulties of sampling should be discussed, so that when students start their apprenticeship in industrial laboratories they will be forewarned of impending sources of trouble.

Also the production man has an equivalent obligation to understand sampling as a principle and to know that when he selects a sample to send to his laboratory he becomes a joint partner in crime if the analytical results fail to reveal the true conditions or what common-sense observation indicates to be the truth.

A Fine Idea, but Is It Legal?

THE Federal Farm Board is reported to feel so keenly about the lack of business acumen on the part of dairy companies, in maintaining expensive delivery systems, that it is considering drastic steps to force unification of delivery, so that only one wagon will have to cover a specified territory. The idea would be an excellent one and we believe that many of the large dairies would willingly consolidate on this basis, except for fear of violating the Sherman Anti-Trust Law.

In large cities apartment dwellers can testify to the waste of permitting several different deliverymen to climb stairways every morning to deliver milk, when one could do the whole job just as well. Nobody is more conscious of the possibility of economies in this line than are the dairymen themselves. It does not take the Federal Farm Board's recommendation to awaken them to the truth of this statement.

Long ago one of the large dairy companies informed FOOD INDUSTRIES that the delivered cost of milk could be reduced to the consumer by one cent or more a quart, if the federal laws would permit consolidation and unification. Waste in distribution exists in this country for several reasons, not the least of which is the influence of the Anti-Trust Law. Furthermore, the milkman is a human being. Studies made on the activities of milkmen indicate that it is impossible for the average milkman to climb more than 300 flights of steps per day without very rapidly incurring a physical breakdown, which, of course, removes him from the job. Expansion of delivery efficiency in the fluid milk industry, therefore, can come about only through permitting the milkman to carry more milk or serve more customers on each climb of a stairway, but as long as the Anti-Trust laws are in their present form, no well-managed dairy company will knowingly incur the possibility of investigation or lawsuit by consolidation with its largest competitors.

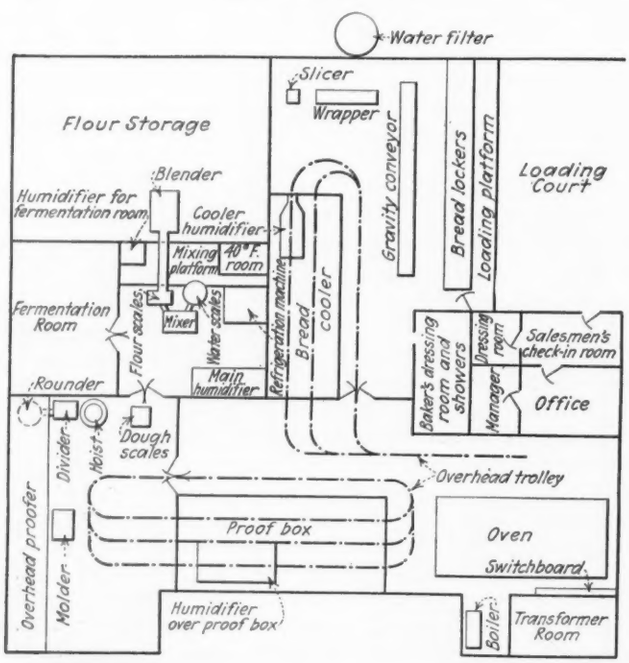
Overcoming Climatic Handicaps By Air Conditioning

By EARL D. STEWART
Assistant Editor, Food Industries

SELDOM do climatic conditions make air conditioning of an entire plant necessary. However, a bakery built at El Centro, Calif., in 1929 has this feature, and is an example of what efficient air conditioning can accomplish.

There probably is no inhabited district within the continental United States where higher temperatures and lower humidities prevail than in the Imperial Valley, at the southeastern corner of the State of California, where El Centro is situated. This remnant of the Gulf of California, dammed off ages ago by the delta of the Colorado River, has long since dried up to a below-sea-level basin surrounded by mountains that effectively cut off any cooling sea breezes. Temperatures of 120-125 deg. F. have been recorded, and 110-115 deg. F. is ordinary in the summer months.

Fig. 1—Sketch layout of air-conditioned bakery at El Centro, Calif.



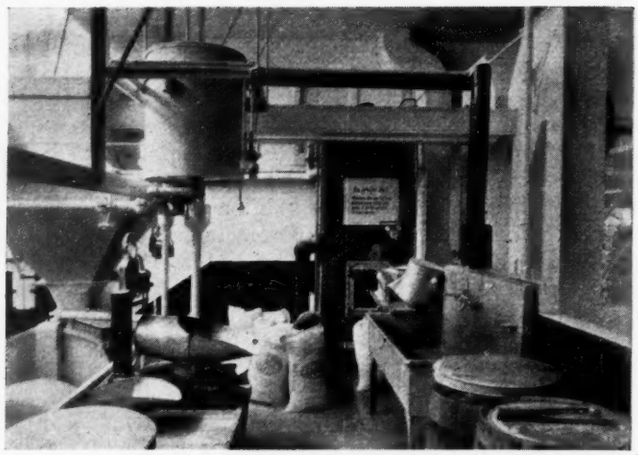


Fig. 2—Mixing platform with flour and water scales at left, elevator and conveyor from flour storage room at right and overhead

In a modern, large-scale bakery in such a climate, difficulties would arise in controlling fermentations that will immediately occur to any experienced baker, and the personal discomfort incident to working in such a shop is obvious to anyone. Consequently, when the Cramer Baking Co. of San Diego planned the construction of a new unit at El Centro, the county seat of Imperial County, these factors of purely nominal importance in more normal climates took on more than ordinary significance. The most obvious result of the planning that went into the new plant has been the establishment of as cool a spot as exists in the Imperial Valley—and that in a bakery! On the day that I visited El Centro thermometers were registering 107 in the shade and what wind there was might well have come from the door of a furnace, as far as any cooling effect was concerned. To step into a room at 80 deg. was the pleasantest kind of a shock, as well as ample testimony to the effectiveness of the air-conditioning equipment.

The building is of one-story, heavy steel and concrete construction with a wooden floor and a special roof designed to insulate the interior from the heat of the sun and to be fire-resistant as well. This roof is composed of 4 in. of fire-resistant insulation, topped with a double layer of asbestos roofing, white in color, so that it will reflect as much heat as possible. Between the roof and the ceiling is a 6-ft. air space that furnishes additional insulation. The walls of the building are suspended from the steel framework after the manner of sky-scraper construction and do not rest on the ground, so that in the event of earthquake shock the chance of fracture of the walls is greatly reduced.

To the east—the building faces south—is an open space for parking delivery trucks and for maneuvering them into the loading court under a roof at the northeast corner of the building (see Fig. 1). Directly in front of the court is the office, with a small anteroom provided with a wall desk where drivers may make up their sales reports on returning from their routes.

At the northwest corner of the building is the flour storage space. From here the flour is emptied into a blending hopper with a screw conveyor in the bottom that moves it to a bucket elevator leading to a conveyor near the ceiling. The conveyor empties the flour into a sifter and weighing hopper above the mixer. The water weighing scales also are here, and the flour and water are weighed automatically into an 800-lb. mixer.

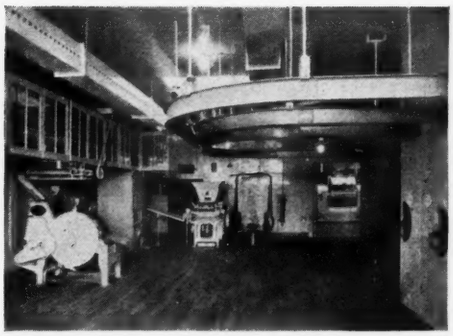


Fig. 3—Make-up room with trough hoist slightly elevated from floor. Discharge side of dough mixer is seen through the door in the background at the right. Louvered square pipe at upper left is the cold air duct for this room

The beams of the water and flour scales are accessible from this platform and a small 40-deg. cold room is provided on the same level for storage of other ingredients of the mix. The humidifier for conditioning the air in the fermentation room is on the same platform, with the control easily accessible (see Fig. 2).

When the sponge in the mixer has reached the desired consistency and the proper temperature, as shown on a thermometer on the mixer housing, the mixer is tilted and the dough dumped into metal troughs mounted on casters. The dough in the troughs is wheeled into the fermentation room for the first fermentation. Later it is returned to the mixer for the remainder of the ingredients to be added, and again goes to the fermentation room for the final rise before going to the divider.

When fermentation is complete the troughs are pushed into the make-up room. Since this bakery is all on one floor, it is not possible to transfer the dough from trough to divider by dropping it into the machine set on a lower level. Instead, the troughs are raised on a hydraulic hoist (shown slightly elevated from the floor in Fig. 3) to a level sufficient to allow the dough to flow into a four-pocket divider. A short conveyor flight carries the loaves into a rounder, from which they drop into the pockets of an overhead proofer. After a 10-min. passage through the proofer the loaves drop into a molder and are then placed in pans carried on racks moving on the overhead trolley system which conveys them to the proof box. Two distinct trolley systems are used, one carrying pans and panned dough and the other carrying baked loaves into the cooler.

From the proof box the racks of loaves move to a position near the oven, which is of the electrically heated single-lap tray type with a rated capacity of 1,500 lb. per hr. The variation in speed of baking required for loaves of different size and type is obtained with a variable-speed transmission. A small gas-fired boiler supplies steam for the proof box, and for the oven when needed. With this type of oven the pans are placed on the top half of the lap moving into the oven and are removed at the same end from the bottom or return half of the lap (see Fig. 8). One man is required to load the panned dough onto the trays and another to remove the baked loaves.

Loading and unloading the oven is hot work, but the discomfort of the job is lessened somewhat by a cold-air duct that has been placed in the floor in front of the oven (see Fig. 8) and an exhaust fan in the ceiling above. Since this is the warmest spot in the plant, this arrangement, by removing the heat continually escaping here, decreases the load on the air-conditioning system.

Baking at the El Centro plant usually is done at night, though on Fridays there is a day shift as well, so that no baking is done on Saturday. Night operation secures the saving of an off-peak (electric) rate.

From the oven the trolley carries the hot bread into the cooling tunnel. The hot pans are taken into the room alongside the cooling tunnel and placed under a hood connected to the cold-air duct near the ceiling (see Fig. 9). By opening a damper a flood of cold air is released to flow down over the pans, and the period of cooling is thus much shortened. The number of pans necessary for continuous operation is considerably smaller with this method of cooling than if they were allowed to cool by radiation in the ordinary way.

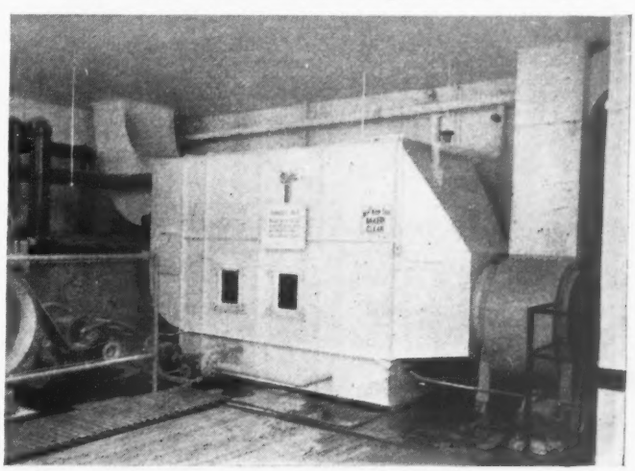
The bread cooler operates on the counter-current principle. The trolley rails extend through the tunnel and the racks of bread are cooled by a blast of cold, moist air entering at the exit end of the cooler. This results in a gradual tempering of the bread, as the coolest bread is in contact with the coolest air. The bread is cooled sufficiently for slicing or wrapping in about an hour and a half. From the cooler the loaves go to a wrapping machine having a capacity of 50 loaves a minute, or to a slicer if sliced bread is to be made.

Four controlled humidifiers (see Fig. 5) condition the air for the different parts of the bakery. These were built and installed by the Booth Engineering Co., Los Angeles, which also built the proof box and the bread-cooling tunnel and erected the overhead trolley system.

In the base of each humidifier unit is a tank of water maintained at a depth of 12 in. by a float valve, as shown in Fig. 10. A centrifugal pump forces the water through a group of nozzles mounted on vertical riser pipes and sprays it over brine coils in the upper part of the humidifier. A thermostat bulb is placed in the spraying water, and through its operation the desired temperature of water is maintained. If the water becomes too cold, the brine is shut off in the coils and a steam injector is opened in the water tank below. The reverse operation takes place when the water becomes too warm. By placing the brine coils so that the water is sprayed over them, the rate of heat transfer is raised and there is less lag in obtaining the desired water temperature.

The air to be cooled and humidified is drawn through the water spray, where it takes up moisture and in so doing a part of its heat is absorbed by vaporization. The

Fig. 4—Main humidifier. This machine supplies washed, cooled air for the entire building except for cooler, proof box, and fermentation room, which have individual humidifiers. Note control instruments just above the sign



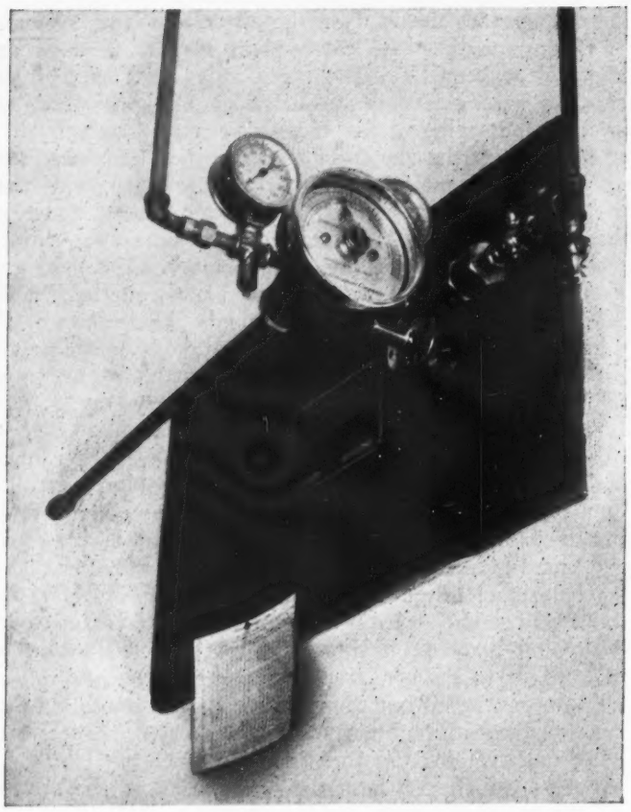


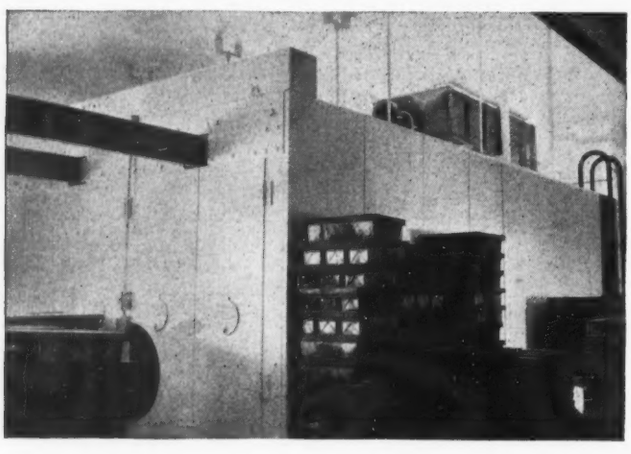
Fig. 5—Control instruments used in fermentation room

usual air velocity is 500 ft. per min. After passage through the spray the air contains entrained droplets of water as well as vapor. A short section of trapped baffles removes the entrained water and the moistened air is then warmed, if necessary, by passage through a radiator before entering the ducts leading to the rooms where the conditioned air is used.

A 20-ton refrigerating machine, driven by a 40-hp. motor, furnishes refrigerated brine for a cold-water tank, for the cold storage room for yeast, milk, and shortenings, and for the humidifiers. The operation of the compressor is automatically controlled by a thermostat in the brine tank.

To make air-conditioning equipment effective, and efficient as well, some study must be given to the job it is supposed to do and the conditions under which the job must be done. In a bakery the fundamental requirements are to maintain optimum temperatures and humidities in the fermentation room and proof box. In

Fig. 6—Proof box, showing location of humidifier above box



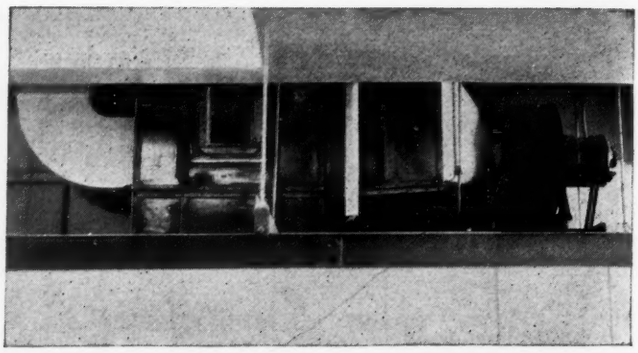


Fig. 7—Proof-box humidifier, showing motor, fan, and control

this particular bakery it also was necessary to bring all indoor temperatures down, and the humidity up, and to provide a system for quickly cooling the baked bread. There were then four temperature and humidity requirements, all different, and four air-conditioning units, all slightly different, were installed.

The biggest air-conditioning problem in the bakery was to bring the general shop temperature down to 80 deg. F. and the relative humidity up to 60 per cent. The space to be conditioned included all the space in the plant except the fermentation room, the proof box and the bread-cooling tunnel. Estimating the capacity requirements of a general cooling and humidifying job of this kind depends on several factors. Climatic conditions, the maximum and minimum temperatures and the average temperatures and humidities, perhaps come first and call for reserve capacity to take care of extremes. Heat and humidity generated by plant equipment and processes, and the heat capacity of machinery and supplies are then estimated. These factors being evaluated, the actual furnishing of cooled (or warmed) and moistened air becomes an application of principles that probably are as well known as any in science or any branch of engineering.

Heat insulation of walls, ceilings, and floors is important. Air conditioning is possible without heat insulating the building, but it is inefficient and expensive. Equipment layout that groups operations calling for a definite temperature and humidity in one room is almost a necessity, and if the arrangement is such that there is the minimum number of workers passing into and out of such rooms, so much the better. Self-closing doors into such rooms are desirable.

The handling of raw material into a plant using air conditioning is worth a little care. This is more important in a bakery, perhaps, where temperature shock in mixing of ingredients is to be avoided.

After taking all these things into consideration, the main humidifier of the Cramer bakery was designed to furnish 12,000 cu.ft. of air per min. at 80 deg. F. and a relative humidity percentage of 60 with a permissible variation of two degrees in temperature and 3 per cent in relative humidity. The air to be conditioned is drawn normally from outdoors, though a bypass for recirculation of some air is provided. This is used mainly during the summer months. A 5-hp. motor operates the fan and a 7½-hp. motor the water pump on the unit.

The humidifier for the fermentation room is of vertical type to economize space. It is built entirely of copper and is designed to maintain 78 deg. F. and 75 per cent relative humidity within the same limits as the main humidifier. The air of the fermentation room usually is recirculated and fresh air admitted only when

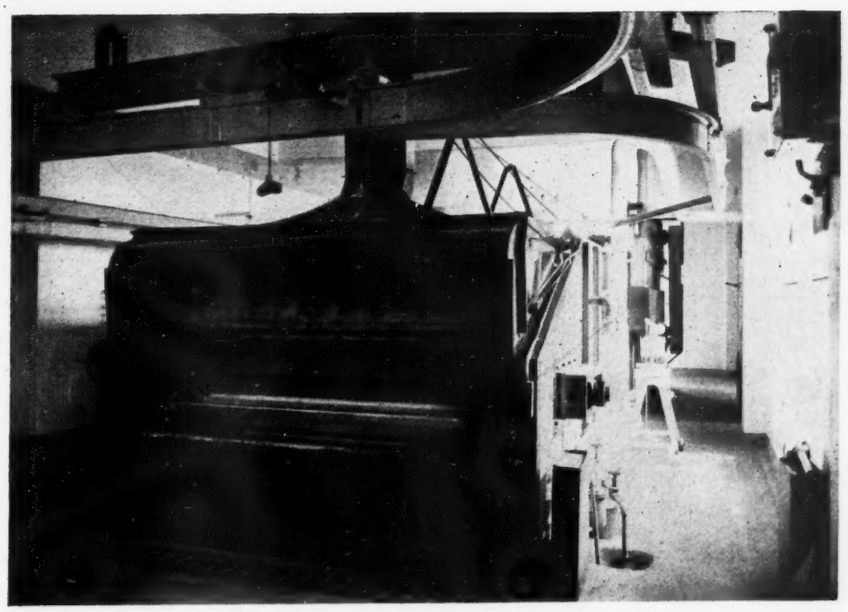


Fig. 8—Open end of electric oven. Panned dough is placed on the trays as fast as the baked loaves are removed. The cold-air duct in the floor is clearly seen

necessary. This unit is rather small and requires a ¾-hp. motor on the fan and a ¾-hp. motor on the pump.

The unit for air conditioning for the proof box is similar to the two just mentioned but it uses no refrigeration, as it must maintain a higher temperature than that in the rest of the shop. Recirculation of air is used, the temperature in the proof box being maintained within 2 deg. of 95 deg. F. and within 5 per cent of 75 per cent relative humidity. Again the unit is built of copper, though the ducts leading to and from the box are of aluminum. Two motors are required: 1-hp. on the fan and ¾-hp. on the pump. The proof box itself is built up of panels insulated with 1 in. of Insulite sealed in galvanized sheet metal. Bakery air-conditioning equipment for fermentation and proof box must be built to withstand the acid vapors that arise from fermenting dough and, to a smaller degree, from hot baked bread. In the humidifiers described above, Toncan iron is normally used, but the units taking care of the fermentation room and proof box use copper throughout.

The fourth and final unit takes care of the bread-cooling tunnel. This unit has neither refrigeration nor heating, but simply a bank of water sprays. Outside air is brought to 80 deg. F. and 75 per cent relative humidity, passed through the tunnel beginning at the cooler end, and finally exhausted through a vent in the roof. Three motors are required: 3 hp. on the main fan, ¾ hp. on the water pump, and 1 hp. on the exhaust fan. The bread-cooling tunnel is of the same insulated construction as the proof box and will cool 1,500 lb. of bread an hour to 85 deg. F. in the middle of the loaf, within a 90-min. cooling period.

The cost of the four air-conditioning units was under $10,000, a rather moderate investment, for without it, successful, large-scale baking would be virtually impossible in the summer climate of the Imperial Valley.

Fig. 9—Discharge end of bread cooler looking toward oven room. Note humidifier on top of the cooler, the cold air duct near ceiling, and the pan-cooling hood leading from it in the left background

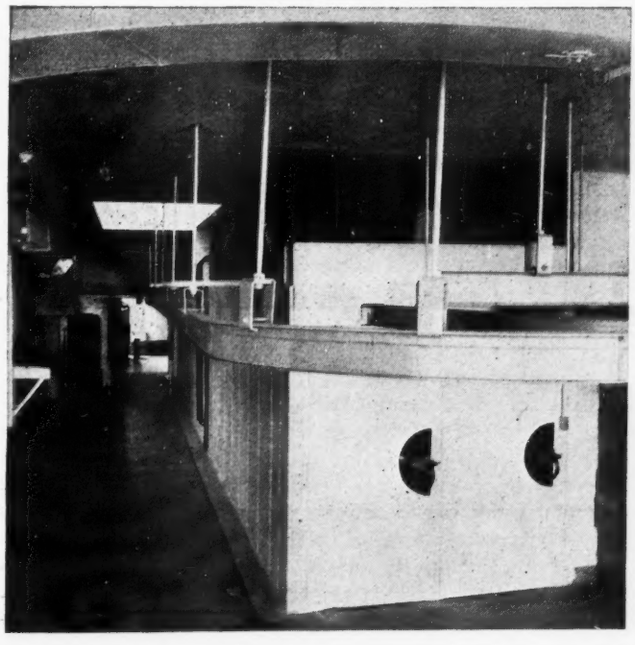
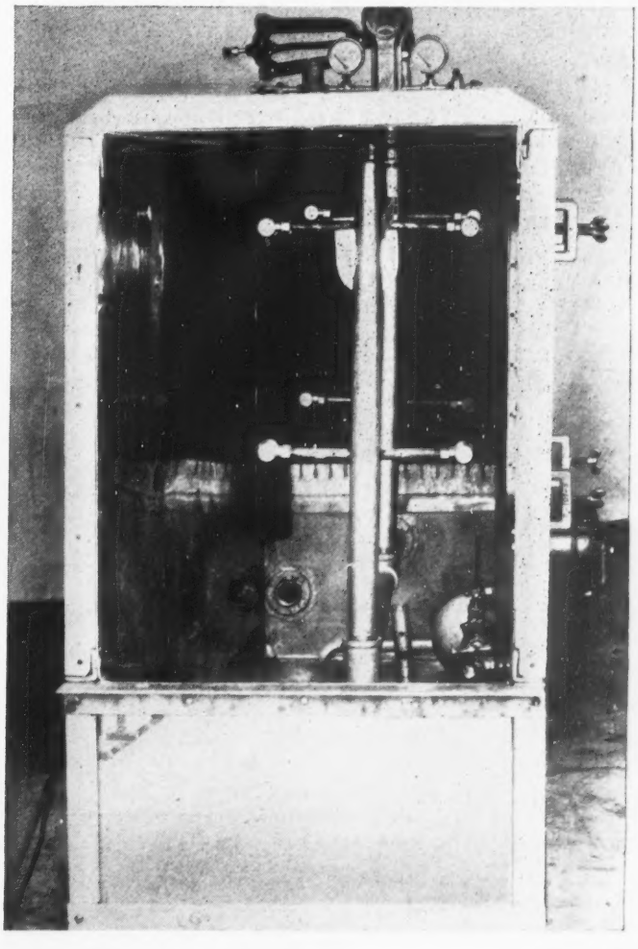


Fig. 10—Interior of an air-conditioning unit. Spray nozzles, float valve, baffle plates and control equipment are visible. This unit has no brine coils, which would normally be placed between the riser pipes holding the spray nozzles



Cartridge Refrigeration As Used by an Ice Cream and Milk Distributor

By K. W. RANNEY
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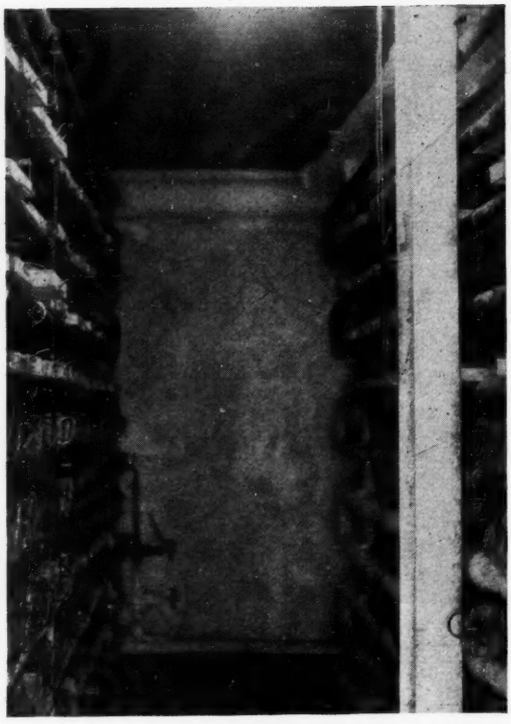
Santa Ana, Calif.

IN almost all industries the quality of the product has been improved and the unit cost of manufacturing has been gradually decreased over a period of years, but the delivery or distribution costs have increased enough to more than offset the saving in manufacturing. This is partly due to better service, but a large portion of high delivery cost is due to an increased overhead and to out-of-date methods of distribution. The milk and ice cream distributors are no exceptions. They have cut the pasteurizing and bottling costs and ice cream manufacturing cost, but the distribution cost has in many cases increased.

Small ice cream cabinet holding four cartridges per hole. It will keep ice cream for 48 hr., or two of the four may be changed every day. The temperature of this cabinet is between 6 and 10 deg. F.



Aisle in cartridge hardening room which is maintained at about —15 deg. F. It shows the triangular cartridges used for ice cream cabinets and the flat ones used for milk boxes

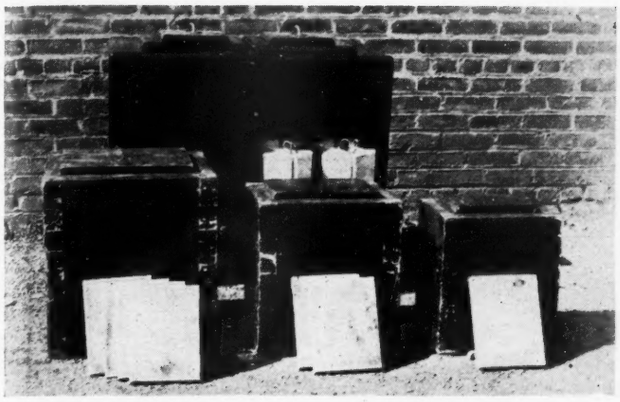
The average milk pasteurizing and bottling, and ice cream manufacturing plant, has its refrigeration problems fairly well worked out for the present stage of the development of the business. It has automatically regulated direct-expansion or brine coolers for milk and also direct-expansion continuous and batch freezers for ice cream.

In spite of these improvements in their plant refrigeration practice, many of the ice cream distributors are still using the ice-and-salt method of refrigerating the ice cream after it leaves the plant. This involves the use of heavy trucks and heavy water-soaked bodies that can carry enough ice and salt to refrigerate the ice cream on the route, as well as in the customer's place of business. It also means furnishing free ice to the customer in order to keep his good will, for if the manufacturer does not do this, a competitor will.

The depreciation of the salt-and-ice truck and body is quite high, on account of water soaking the wood and the rusting action of the salt on metal parts. Extra labor is necessary on an ice-and-salt truck, because of the large quantity of material that has to be taken out of the truck and carried to the customer's cabinets and because of the necessity of draining off the brine and repacking the cabinet.

Also, it is very hard to please the customer when his ice cream is packed with salt and ice, because it is impossible to pack so that the cabinet will have the same temperature for 24 hours. The driver is very likely to spill salt and ice, or brine, on the floor, or salt may get into the ice cream. It is difficult to keep the cabinet looking well and it has to be painted often. For these reasons and others, something different is needed.

The first change that most ice cream distributors make is to use mechanical refrigeration for the larger customers, such as drug store fountains, but this still leaves



The three packers in the foreground are for home or special delivery orders and take 4, 2, and 1 cartridges, respectively. In the background is a small cabinet, used for small retailers, having four cartridges that will keep both holes for 24 hr. or one for 48 hr.

a large number of small customers' cabinets to pack with salt and ice, and the truck is still a salt-and-ice truck. At the present time it is not practicable to buy mechanical cabinets for the small stops, and they will not buy electric cabinets for themselves, because of the fairly high cost and the fact that they will have to pay for the electricity to operate them.

Some distributors have used solid carbon dioxide in place of the brine tank on the truck to keep the ice cream in good condition. This saves quite a little weight and is very satisfactory when there are no salt and ice customers on the route. However, it cannot be used to pack up the customer's ice cream cabinet (except in a limited way for individual packages), because of the high cost and the problem of maintaining the right temperature to dip (between 6 and 10 deg. F., depending upon the sugar content). The use of solid carbon dioxide to pack up individual orders for home delivery is very satisfactory and saves a double trip to pick up the packer if a single service container and packer is used. It makes a very light and neat package, but the packing cost is fairly high and the ice cream may be too hard to serve if the customer does not understand this method of refrigeration.

Still other distributors have used the cartridge system of refrigerating the ice cream on the routes and in the smaller customers' cabinets and, in some cases, even the larger fountains. The source of refrigeration in the cartridge system is the cartridge, which is a sheet-metal container nearly filled with a solution that has a constant freezing temperature throughout the whole period of freezing and that also melts throughout at the same temperature. In other words, the freezing point is the eutectic point for the chemical in solution or it is the freezing point of the saturated solution. For example, the eutectic point of a solution of sodium chloride (ordinary salt) is —6 deg. F. and that of calcium chloride is —60 deg. F. Neither of these salts can be used, because the eutectic point is too low. A material to be satisfactory must have a eutectic point between 3 and 5 deg. F.

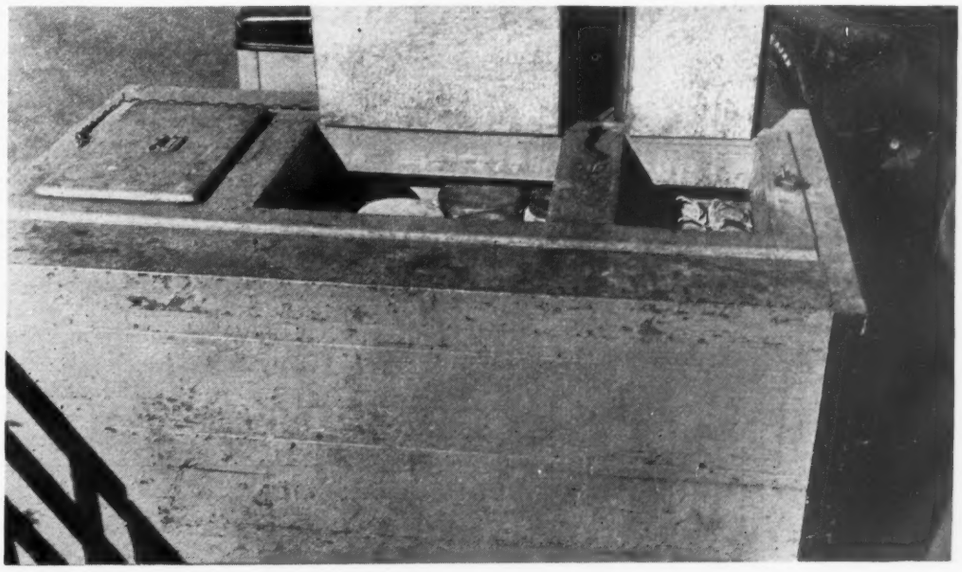
The chemical used should have as large a negative heat of solution as possible, for a cartridge, to be satisfactory, should receive between 25 and 50 per cent of its "effective" refrigeration from the absorption of heat when the chemical re-dissolves after it crystallizes out on freezing. The other 50 to 75 per cent will be due to the melting of the ice. This is an important factor, as the more efficient the cartridge the less weight there is to be handled and carried on the truck and also less cabinet space is used for cartridges.

The solution should be one that will not rust out the container too fast or one in which the hydrogen-ion concentration can be adjusted so that it does not rust. It also should be one with a fairly high rate of heat transfer through both liquid and solid phase, or it may take too long to freeze or an excessively low temperature in the hardening room would have to be maintained, which is inefficient. It should not cost too much, but this is a small factor compared to those given above, because it can be used over many times.

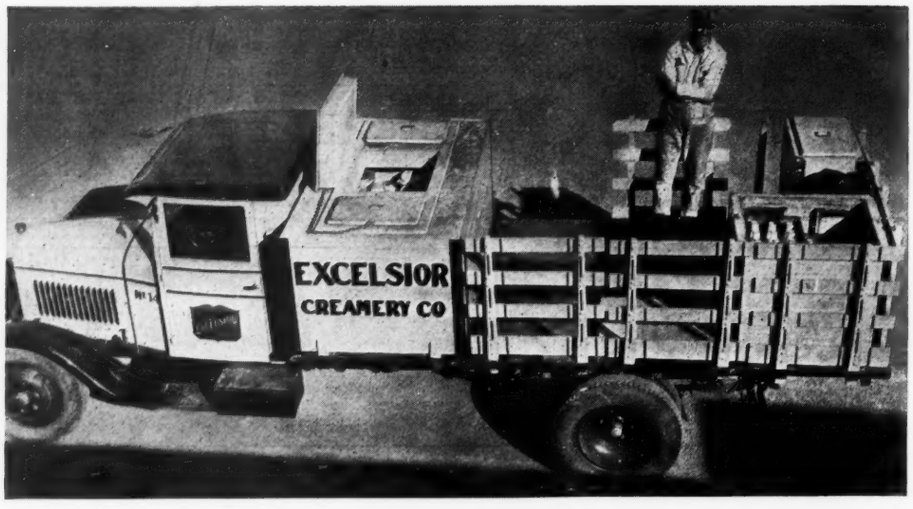
A comparison of the three types of refrigerating mediums is given in the accompanying table.

	Solid Carbon Dioxide	Cartridge Eutectic Solution	Ice and Salt
Cost per pound	6c.	0.25c.	0.21c.
"Effective B.t.u." per pound at 10 deg. F. × Heat absorbed below 10 deg. F., which is maximum temperature for keeping ice cream	245	142	85
Cost of refrigeration at plant per 1,000 B.t.u.	24.5c	1.76c.	2.47c.
Pounds of refrigeration medium per 1,000 B.t.u.	4.08	7.04	11.88

The cost of the salt-and-ice mixture is based upon $3 per ton for the ice and $9 per ton for the salt, and four parts of ice to one part of salt. The cost of the cartridge refrigeration includes all costs of the hardening room and



Ice cream and cartridge compartments of a truck body. Can be loaded in the afternoon for delivery next morning with enough refrigeration to keep the ice cream an additional 24 hr. for the customer by changing but two cartridges



Layout of a combination ice cream and wholesale milk truck body. The front box contains ice cream in the center compartment and cartridges in the outside two. The box at the back is the refrigerated milk box. Cases of milk are stacked in the remaining space

cartridge cost and depreciation. From the table it is seen that the carbon dioxide costs fourteen times as much as the cartridge, and the salt-and-ice 40 per cent more than the cartridge, based on their "effective B.t.u." In this respect it is well to say that the carbon dioxide has a rate of heat conductivity of only 54 per cent of that of air and if the insulation can be filled with it the efficiency will be increased.

The "effective B.t.u." does not necessarily show which will keep ice cream the longest, as the cabinet is a very important part of the system. For example, the old salt-and-ice cabinets we used had only about one-half the efficiency of the cartridge cabinets we are now using. This means that for each 1,000 B.t.u. in the form of frozen cartridge solution we had to use enough salt and ice to equal approximately 2,000 B.t.u. Thus the actual cost of the salt and ice was 2.8 times that of the cartridges at the plant instead of only 40 per cent more. About 24 lb. of salt and ice was used where we now use 7 lb. of cartridges, which makes a big saving in cost of hauling the materials.

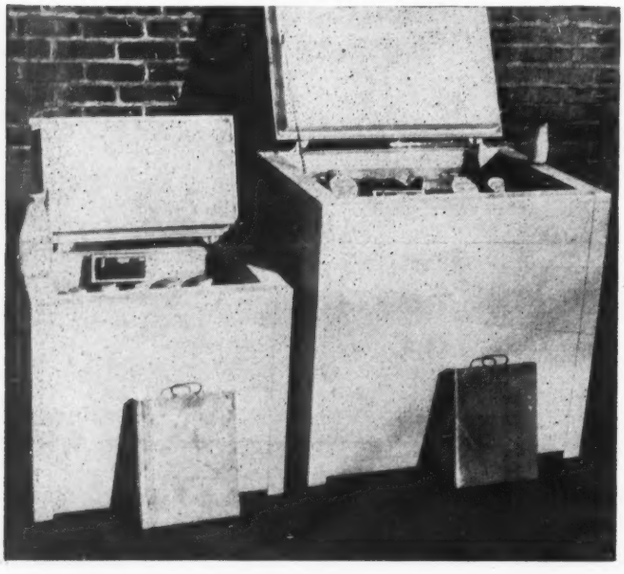
The cabinets and truck bodies we use are insulated with a kapok insulating material which, according to the U. S. Bureau of Standards, is about 20 per cent more efficient than slab cork and weighs only about one-sixth as much. The light weight is very important for truck bodies.

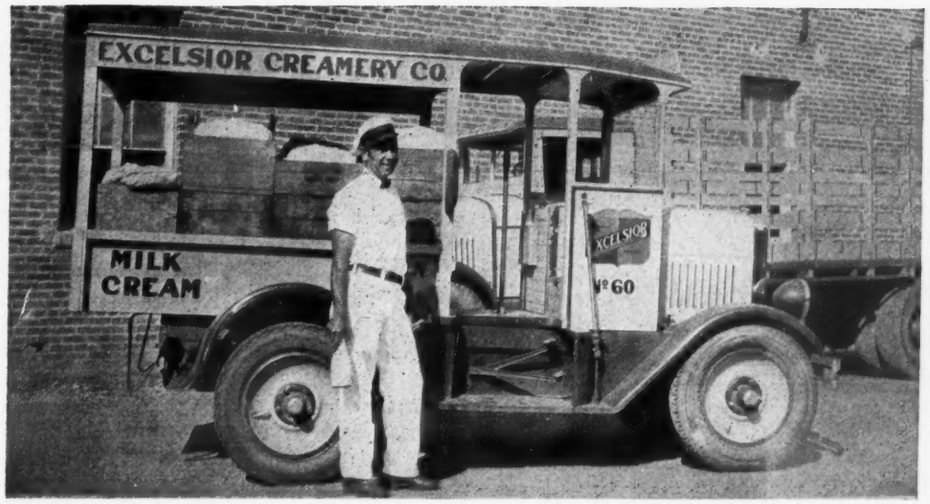
All of our truck-body cabinets, in which the ice cream and cartridges are carried, open only from the top. This cuts our refrigeration losses on the route about 30 per cent, due to the fact that cold air, being denser than warm air, when a refrigerator with a side door is opened the cold air flows out and the warm air goes in, while in the case of a door at the top there is no change in air, except what little gets mixed in during the transfer of products in and out. The disadvantage of the top entrance is that the driver has to get on his truck at every stop, but the driver soon finds that this is more than offset by the fact that the ice cream and cartridges are more accessible when almost any part of the top can be opened, while he has to work through a small side door with the other type of body.

We found that when we changed from ice and salt to the cartridge system we could change from 2½-ton trucks to 1-ton and eliminate a few routes and all the helpers for the drivers besides. Instead of doing this we thought it better to make combination milk and ice cream routes. That is, we let one truck and driver deliver both wholesale ice cream and milk on his route. Before this change there was about 80 per cent duplication of service to customers, which nearly doubled our truck expense. Now a driver can take care of about 75 per cent as many customers as he did before, and deliver both wholesale milk and ice cream instead of just milk or ice cream.

For home delivery we have three sizes of cartridge packers, all using a standard cartridge. These packers will keep ice cream 24 hr. if necessary, and therefore we deliver nearly all our special orders of ice cream on our regular route deliveries (either retail milk routes or combination wholesale routes). This means that many orders will be delivered 6 to 12 hr. before the customer uses the ice cream and hence eliminates any worry on the part of the customer as to whether she will get the order in time to serve. The ice cream is never too hard or too soft to serve. The packer is neat and dry and the ice cream can be easily taken out by taking off the lid of the packer. If the customer does not use all of the ice cream it can be put back in the packer and it will keep until the next meal. The time and cost of packing the orders this way is much less than with either salt-and-ice or solid carbon dioxide; the delivery cost is much less when it goes on the regular routes and about the same as ice-and-

Close view of cartridge-refrigerated milk boxes, the small one for retail routes and the large for wholesale. These boxes are supplied with cartridges that maintain a temperature of 35 deg. F. for 24 hr.





Retail milk truck with cartridge-refrigerated milk box in the front compartment

salt or carbon dioxide if a special trip is made, because the regular driver can pick up the empty packer next day.

As a whole, our delivery cost for ice cream has been decreased 25 per cent and, as about one-half of the gallonage goes into mechanical equipment, this means that the part that was changed from salt-and-ice to cartridge equipment must show a 50 per cent saving over salt-and-ice to give an average of 25 per cent for the total gallonage.

We use a cartridge refrigerated box which will hold approximately 10 per cent of the load on all of our milk routes. This box maintains a temperature of about 35 deg. F. for 24 hr., so there is no appreciable deterioration or bacterial growth in any milk product left in this box overnight. Even the cream line does not shrink much at this temperature, and many times it has been better than the regular load the next day. The driver fills this refrigerated box when he loads his milk and will leave it until the last of the route to use, so that he will have better refrigerated products for the last customers, who ordinarily get quite warm products in summer.

The insulated milk boxes without the cartridges, or with the cartridges warmed, can be used in freezing weather to protect the products from freezing.

We have had this system of handling milk in use for over a year and have yet to receive a complaint from a customer due to the refrigerated box. This is much better than the old method, where milk products that have been returned from the routes are sorted by guess, recooled and then sent out the next day. This method is sure to cause some complaint from the customer. Many milk companies have found this method unsatisfactory in the long run and dump all return products and use them in products such as cottage cheese, cultured buttermilk, and ice cream. This was the method we followed until we started the use of the refrigerated box on the routes. The dumping is very costly and the quality of the cottage cheese, cultured buttermilk, and the ice cream is bound to suffer, as returned products exposed to the warm weather are not as good as fresh milk and cream.

With our present method we sell over 99 per cent of all bottles and packages filled and counted at the filling machines. The 1 per cent takes care of any loss due to breakage, unsatisfactory packages, bottles not full, or any returns picked up on the route, and any products not sold the second day, such as whipping cream. The cartridge refrigerated milk box we use will save the cost of pasteurizing, bottling, caps, storage-room expense, case expense, cost of dumping, loss of product in dumping, decrease in value of product dumped from value fresh, and cost of washing dump bottles on about 25 units of product per day per retail route, which averages more than 4½c. loss per unit in our plant. This is a saving of about $1.12 per day. The total operating cost of the system is about 10c. per route, which leaves a net saving of over $1 per retail route per day. This is a saving, then, of 0.3c. per point (unit) on a 300-point route, while the average profit is only about 0.6c. per point; in other words, the net profit would be increased by 50 per cent. A proportional saving is made on a wholesale milk route.

The cartridge refrigeration system can be applied economically to any refrigeration problem where either transportation or a large number of units is involved, and for any temperature between —10 deg. F. and 45 deg. F. Above 45 deg. F., ice would be more economical and below —10 deg. F. solid carbon dioxide probably would be more economical and practical. The designing of equipment for the transportation of frozen foods, such as fish, meat, poultry, fruit, or vegetables, by this method, could be fairly easily worked out for any given temperature by anyone who understands the chemistry and engineering principles involved. A frozen-product cabinet for the food product stores, and routes similar to ice cream routes to serve these stores with the low-temperature refrigeration and the supply of frozen food, can be worked out. This will come when a greater demand for frozen food has been created.

An experimental, insulated, cartridge-refrigerated, retail milk truck which is giving satisfactory service. The rear has a cartridge ice cream compartment for retail ice cream or frozen foods

More Miles for Truck Tires

By L. W. FOX
Sales Engineer
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THERE are two things for which a tire engineer looks when attempting to solve a particular operating problem. The first question is: "Has the operator the right size and type of tire and rim for his job?" The second is: "Does the tire equipment have proper care?"

In analyzing the first question to determine why the size and type in use may not be suitable, we have to take into account road conditions, length of haul, speed, load, and a number of other factors. It is not necessarily a criticism of the truck manufacturer if his choice of tire equipment as originally installed is not what you should have. Obviously, the manufacturer has attempted to standardize on the various component parts of his truck in a manner acceptable to the majority of operators, but your problem may not be that of the average truck owner.

The question of size and type of tire is difficult to discuss in a general manner. It is always advisable, in figuring tire size, to use the standard tire load ratings of the industry, as established by the Tire & Rim Association. It is advisable also, in computing the load to be carried per tire, to allow for the maximum pay load, plus the weight of the truck. If it works out that more tire is applied than may be needed under certain conditions, it is better to have this factor of safety resulting in better tire mileage and assurance against road delays.

In computing tire loads, it should be kept in mind that the gross load is not necessarily divided equally over the number of tires supporting it, although oftentimes this is used by operators as a means of figuring pay-load capacity. Usually, the rear tires are loaded more heavily and it then becomes necessary either to weigh each axle of the loaded truck or else weigh each axle of the empty truck and calculate the distribution of the pay-load front and rear to be added to the empty weights. This matter of calculation is very easily and quickly accomplished. The center of the load is located with respect to the axles as shown by "A" and "B" in the accompanying diagram. The following simple formulas are then applied, the resultant load distribution being added to the empty vehicle weights on the front and rear axles:

$$\frac{B \times \text{Pay Load}}{\text{Wheel Base}} = \text{Pay Load on Front Axle}$$

$$\frac{A \times \text{Pay Load}}{\text{Wheel Base}} = \text{Pay Load on Rear Axle}$$

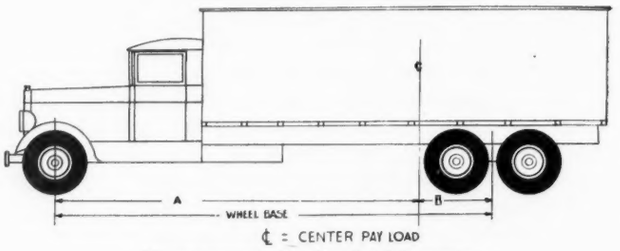
Having selected the proper size of tire, it is of great importance that the rim size be that for which the tire is designed. Undersized rims result in the tire being cramped, made smaller, and its actual carrying capacity reduced.

The second phase of the tire engineer's analysis deals entirely with proper care of the tire in service. The biggest single item of service is proper inflation, particularly in truck tires. The air carries the load, the tire being merely a flexible container to hold the air under pressure. It is obvious that this flexible container will stand a certain degree of flexing without damage. When we consider, though, that the average truck tire flexes more than 10,000,000 times in 20,000 miles, it is evident that the tire must not be allowed to flex an excessive amount each time, or else it will be scheduled for early failure.

The degree of flexing is controlled by load and air pressure. Having selected the proper size of tire for the load originally, it then becomes necessary to maintain proper air pressure.

Where dual tires are used, it is necessary to maintain even pressures for equal load distribution. Occasionally, for operations over heavily crowned roads, it is necessary to inflate the outside tire 10 per cent above the inside to gain proper load distribution. Proper mating of dual equipment is necessary likewise for proper load distribution. New and worn tires are difficult to match satisfactorily. Small injuries should be taken care of before they have a chance to spread or deepen.

Some operators make it a point to change positions of tires periodically. This is quite a labor item and is left to the discretion of the operator. Unquestionably,



Measurements for tire load formula

however, it does improve tire service. There are certain mechanical adjustments that must be watched. Front-wheel alignment is very important. Certain classes of operation require more frequent inspection than others, due to excessively rough roads, curb shock, and the like.

Brake adjustment likewise is of importance. Uneven braking reacts very quickly on the tires and may show uneven wear on one tire, or a different rate of wear in the various positions. Operation of the vehicles, of course, has an important bearing on tire performance, but may be the most difficult to prove. Fast acceleration and deceleration are without question hard on tire equipment, as well as all parts of the vehicle. General handling of the vehicle on turns, speed, and the like all are factors in performance, as well as tire life.

For light delivery service, we generally find passenger-car chassis equipped with special bodies, but frequently handling loads in excess of the tire capacity. This is further aggravated by loading to the rear for convenience in delivery. The first corrective measure usually is to apply a heavy-duty tire, which is designed to carry more air pressure and hence more load. It may also be possible to apply one oversize and gain proper capacity for safety and economy.

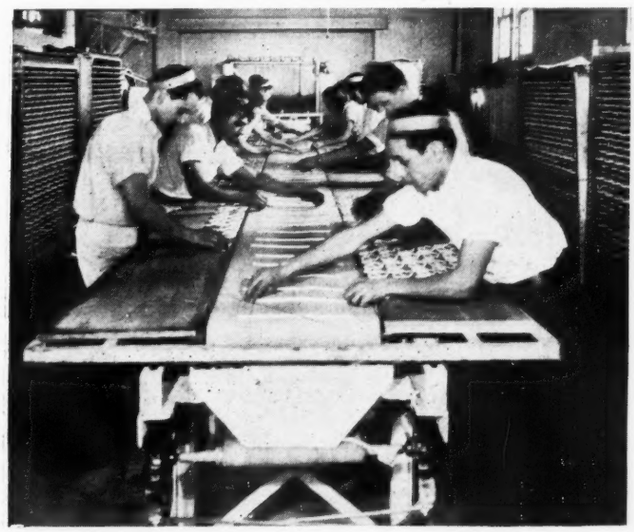
Tires represent the largest single item of expense in truck upkeep and deserve attention in proportion to the other services rendered. Proper tire care will more than pay for itself.

Conveyors Aid Mass Production Of Pretzels

By J. B. NEALEY
American Gas Association

THE modern pretzel plant has mechanized all of the processes, except the "twisting," incident to pretzel production. One of the most modern of this type of plant, equipped to turn out more than 280,000 penny pretzels daily, is that of the Schuler Pretzel Co., Inc., Rochester, N. Y. This concern owns two plants and ships its products all over the country.

The first process of pretzel forming consists of extruding the mixed dough through a die, in a continuous



Three hundred and fifty of these short strips of dough are deposited on the conveyor per minute, to be twisted to shape by hand operators

length of about one-quarter inch diameter. The dough is transferred from the mixer to a hopper which feeds it to the die, and the extruded section is automatically cut into the proper lengths, by a knife, as it passes through. These lengths drop onto a traveling belt conveyor at the rate of 400 per min. The belt is 40 ft. long and has wooden trays on both sides. Operators, lined up on both sides, pick up these strips, throw or twist them into pretzel shape and place them on 4-ft. trays which are removed when full. These trays are loaded onto steel racks with casters and the pretzels proofed for 40 minutes.

Pretzels are cooked and salted before being baked, the cooker, salter, and oven all being mechanized and built into one continuous conveying unit. The cooker is on the charging end of the oven and consists of a steel tank

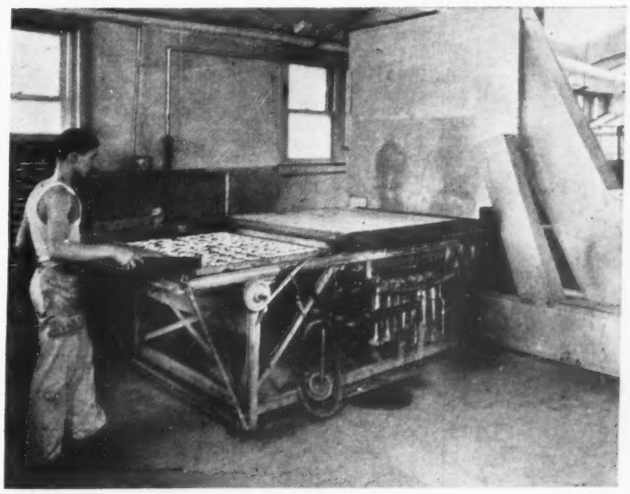
Hand-sorting and packing pretzels

filled with a special formula hot solution, with a motor-driven conveyor to take the pretzels through. This treatment prevents burning in the oven and is an aid in retaining the salt. The tank is 4x4x4 ft. and the conveyor extends 4 ft. beyond for ease in loading. The conveyor is of mesh-type belt. It is hand-loaded from the trays upon which the pretzels have rested during proofing. This conveyor, after passing through the tank, abuts onto the oven conveyor, with a rotating screw between, which transfers the pretzels from one to the other.

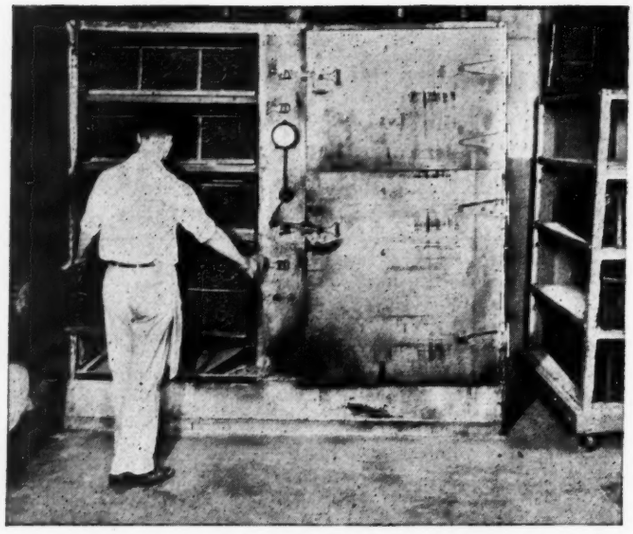
The cooker solution is kept at the boiling point by gas burners located underneath, and more hot water is available, at all times, from a gas-fired boiler close by. The salter consists of a hopper which feeds salt onto a steel roll. These rolls are cut so that the right quantity of salt is removed from the hopper and dropped down through a series of screens which spread it out for even distribution over the pretzels as they pass beneath. Any excess falls through the conveyor onto a belt conveyor which returns it to the hopper by way of a short elevator, as shown in the accompanying illustration. All of these conveyors are driven from the same motor that operates the oven conveyor.

The oven is of sheet steel, insulated, and is 60 ft. long and 8 ft. wide. The conveyor consists of multiple

Loading the conveyor which carries the pretzels through the cooker and salter, and delivers them to the traveling oven



The oven discharges the baked pretzels into wire baskets



Still in the wire baskets, the baked pretzels are dried in this gas-fired kiln

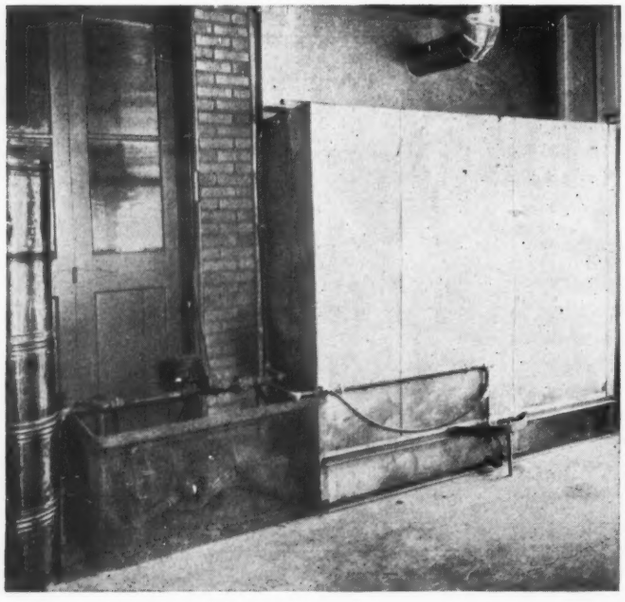
steel plates bolted onto parallel endless chains. Heat is supplied through 57 gas burners, located in the sides of the oven and so staggered that half fire above the conveyor and half below. Four manifolds are employed and gas at 10 lb. pressure is used. There are flues in the roof of the oven, at each end, the one at the charging end running toward the other end for 20 ft. with three take-offs in this distance. Dampers are placed in each.

The oven is supplied with twelve thermocouples and these are connected with recording pyrometers. A temperature of 600 deg. F. is maintained at the top and of 520 deg. F. on the bottom, while the baking periods range from 4 to 7 min. The oven is shut down at night but the temperatures are maintained until morning. The baked pretzels are automatically discharged into baskets of wire screen. The 3-hp. motor driving the conveyor is equipped with a speed reduction gear train and a speed index. The baking period can be changed instantly by regulating the rate of travel of the conveyor with a hand control.

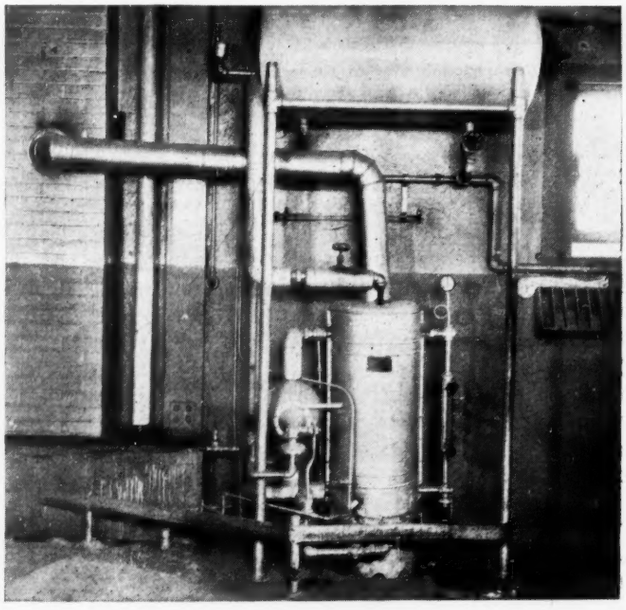
Pretzels are dried in a kiln, after baking, from 20 to 30 min. at 240 deg. F. The kiln used here is of sheet steel 10 ft. wide, 7 ft. high, and 4 ft. deep, with doors opening in the front. This will accommodate 24 baskets at a charge, each basket holding nearly 50 lb. The method of heating is indirect, a separate gas heater of unique design being employed. This consists of a small sheet-steel cylinder 1 ft. in diameter and 2 ft. long with a motor-driven fan occupying one end. A blast-type gas burner fires into the cylinder at an angle, where the gas and air burns and the hot products of combustion are blown into the kiln. The burner also has a motor-driven blower which raises the gas pressure, the same motor driving both the air fan and the gas booster.

After drying, the pretzels, still in the wire baskets, are trucked to the packing room, in which is a long table at which girls are seated with a basket of pretzels each. Cardboard caddies which come flat are opened and stitched together by stitching machines and passed on to the girls who fill them with pretzels. Those for the home trade are packed in round tin cans.

Back of the drying kiln is the gas-air mixing equipment for supplying the burners

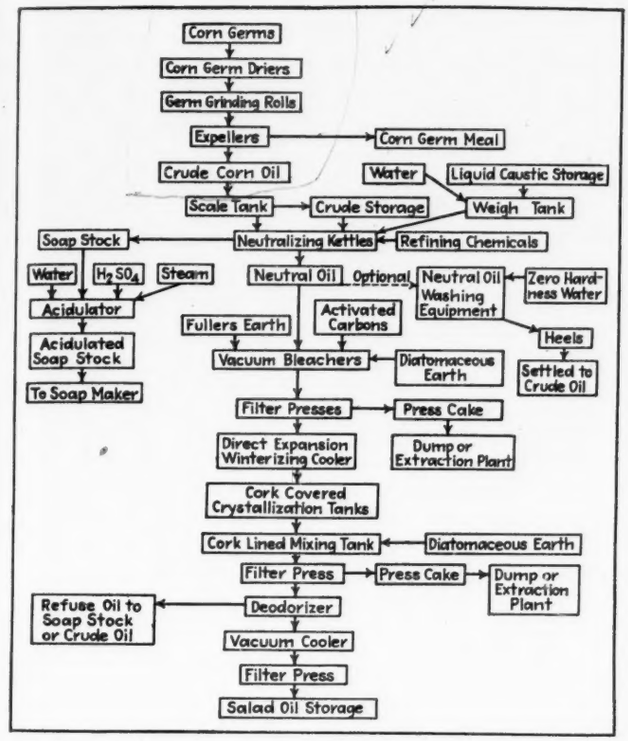


The gas-fired boiler heats the plant in winter and supplies process steam for pretzel making



Making Salad Oil from CORN

By MAURICE M. DURKEE
A. E. Staley Manufacturing Company
Decatur, Ill.



Eighteen steps are required in the process of refining corn oil

THE past decade has witnessed a remarkable development in which factory-produced mayonnaise and allied products have largely displaced individual efforts in the home kitchen. This industry consumes very large quantities of the two leading vegetable oils, corn and cottonseed. Then, too, as the housewives of the country have learned the advantages of cooking with highly refined vegetable oils, there has been a marked increase in the home use of salad oils.

Edible oils and fats are chemical combinations of glycerine with various fatty acids, such as oleic, palmitic, stearic, and many others; and are called glycerides. Each individual oil has about the same fundamental balance of glycerides, with minor variations influenced by the locality and climatic conditions under which the plant has grown. The nature and percentages of the glycerides present determine the melting point of the oil or fat and, unless some protective substance be present, the susceptibility of the oil to oxidation as well.

Corn oil is known as a "natural salad oil," having a melting point of 4 to 5 deg. F. The ultimate composition of corn oil as determined at the U. S. Bureau of Chemistry some years ago, is as follows:

Glycerides of:	Per cent
Oleic acid	45.4
Linolic acid	40.9
Palmitic acid	7.7
Stearic acid	3.5
Arachidic acid	0.4
Lignoceric acid	0.2
Unsaponifiable matter	1.7

There is a growing belief that in this unusual amount of unsaponifiable material lies the explanation of the resistance of corn oil to oxidation. Some of the unsaponifiable must be removed as "wax" in the process of purification, but much can be allowed to remain.

Approximately 100,000,000 lb. of crude corn oil is refined into salad oil yearly. There are, of course, a few minor uses of corn oil other than salad oil. One valuable use of minor volume is the manufacture of neutral soft potash soaps with a low rate of hydrolysis. Combined with sulphur, corn oil can be made into a cheap, rubber-like filler for certain kinds of rubber goods.

Though the germ of the corn represents but 10 per cent of the dry kernel, more than half of the germ is oil. This germ is separated by degerminating corn in the starch, corn sugar, hominy, and butyl alcohol industries. To accomplish the degermination there are two methods: the "wet" and the "dry."

In the wet method of separation, the steeped kernels of corn are rough cracked in burr mills. Then the germs are separated from the other portions by differential flotation in a thin slurry of starch. The dry method, employed in the hominy industry, makes use of aspirators to effect an air separation of the germ after the kernel is degerminated by a special type of mill.

Though hydraulic presses and even extraction have been used to remove the oil from the germs, the method must frequently applied makes use of oil expellers. These expellers are provided with a heavy, slowly rotating shaft surrounded by a barrel made up of heavy alloy steel bars held a few thousandths of an inch apart by "spacers." These bars are just close enough to retain the cake or meal, but permit the oil to pass through the narrow slits. A tremendous pressure—several thousand pounds to the square inch—is set up inside an expeller, and this, together with the frictional heat, causes the oil cells to break down so that oil runs freely from the meal. The high pressure is caused by a series of discontinuous spiral projections on the surface of the central shaft.

Before the germs can be crushed, all but a few per cent of the moisture must be removed. Also, the germs must be ground and preheated before entering the feed to the expeller. After expulsion from the germ, the oil is strained and filtered to remove any particles of meal which may have passed between the bars.

Crude corn oil from such crushing equipment has a

clear, dark golden color, and a strong, not unpleasant, "corn" odor. But olive oil is perhaps the only oil we are accustomed to eat in the raw state, so corn oil must be made bland, neutral, and sweet.

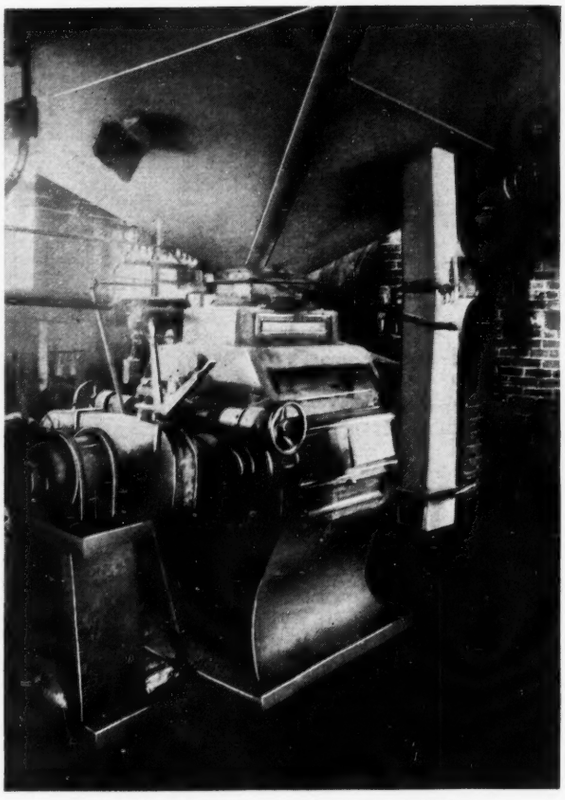
There are four main steps in the purification treatment of crude corn oil. These are neutralization, bleaching, winterizing, and deodorization. No two refiners in the United States carry them out in an identical manner. Some add a further step called "washing" after neutralization and before the bleaching.

Usually, there is 2 or 3 per cent of fatty acid present in the expressed crude oil. Fatty acids are digestible, but are thought to be not nearly as well assimilated as is the pure oil, so it is best to remove them entirely.

The first step in refining, neutralization, consists of treating the crude oil with a strong alkali, usually caustic soda solution, so that the soap formed by its union with the fatty acids and many other impurities will coagulate under a rising temperature and settle to the bottom with a minimum loss of free oil. Other ingredients are often used to aid in the removal of proteins, and the like, or to aid in the coagulation of the floc of soap particles with minimum loss of oil.

Large iron tanks with conical bottoms equipped with variable-speed stirrers, and steam coils large enough for a rapid rise in temperature are used for the neutralization process. A great variety of shapes of kettles and types of stirring devices have been tried and each has its champions.

No exact rules can be laid down for the guidance of the refiner as to the strength and quantity of alkali required without making small-scale laboratory tests in advance. Average good quality wet-process crude oil requires most often a caustic soda solution from 14 deg. to 20 deg. Bé., about twice as much as is required to neutralize the apparent acidity. A starting temperature of 80 deg. to 110 deg. F., an emulsification period of 20 minutes, and a rate of heating usually about 2 deg. per minute are often used, but only long experience will help the kettleman to gage and control the process of neutralization, as this step in refining has not yet been fully rationalized.



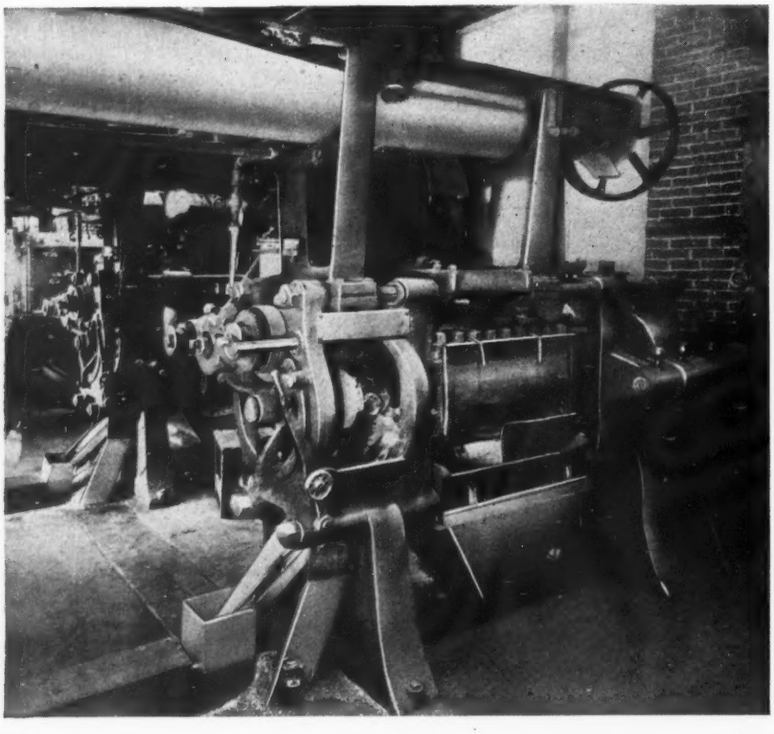
Grinding the germ is the first operation

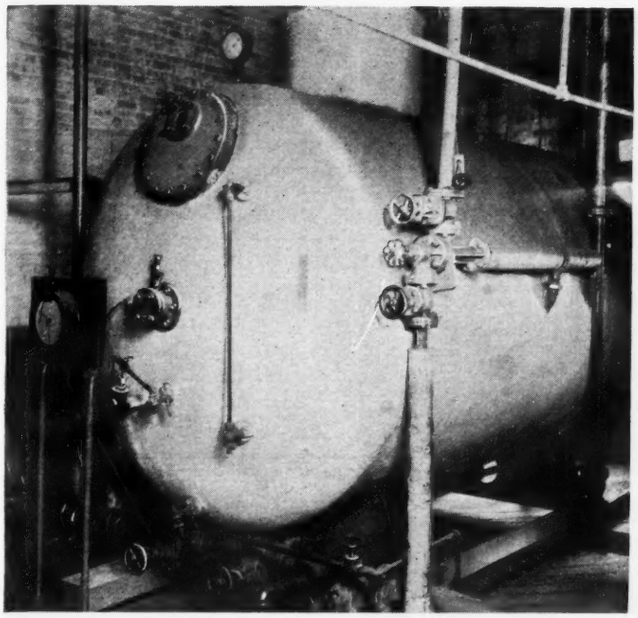
When properly completed, there is left in the bottom of the cone after a few hours a shallow layer of soap stock, containing all the original free fatty acid of the oil, together with a variety of coloring substances, proteins, albuminoids, and traces of other impurities which have been removed by combination or adsorption with the refining chemicals.

The main body of neutral oil, usually 93 to 95 per cent of the original oil, is siphoned off the next day. The oil is now ready for the second main step, called "bleaching." Before treating the oil by fullers earth and activated carbons, some refiners hold that it is necessary to wash the oil with water, in order to remove any traces of suspended particles of soap stock. Others claim that if the neutralization has been carried out properly it is not necessary to wash, and is wasteful to do so. If an oil is washed, it must be dried by heating under a vacuum before bleaching is undertaken.

Bleaching is accomplished by heating to a moderate temperature (135 to 170 deg. F., depending upon the oil) under a vacuum and at the same time stirring in fullers earth, activated carbons, and some filter aid if the activated carbon appears at all colloidal in the subsequent filtrations. The quantity of fullers earth used depends on the color removal desired as measured on the Lovibond tintometer, varying from 0 to 1½ per cent. Activated carbons, which have the property of intensify-

Expellers remove the oil from the meal





Horizontal vacuum tank in which the oil is bleached

ing the bleaching action of the fullers earth and removing some of the odors and flavors as well, usually are included in quantities from 0.04 to 0.15 per cent. A typical bleaching mixture for a high-grade corn oil would be 0.8 per cent American fullers earth; activated carbon, 10 per cent – 20 per cent as much as fullers earth; and purified infusorial earth, equal in amount to the activated carbon used. The bleaching time is about twenty minutes. We agitate while bleaching with a ribbon type of stirrer in horizontal vacuum tanks, the stirrer making about 50 r.p.m.

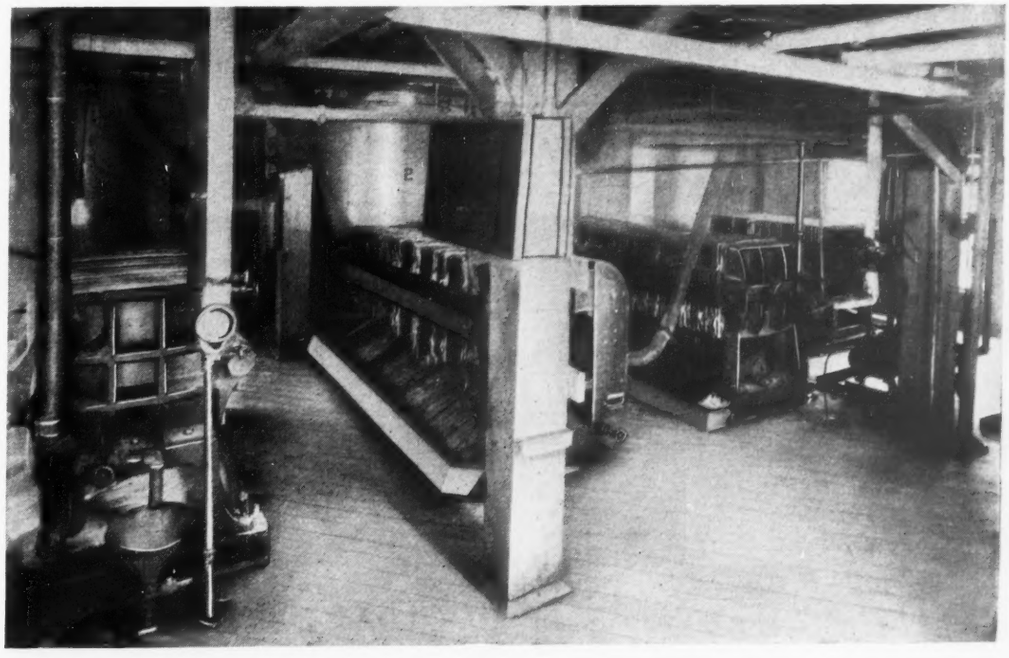
After filtration and cooling, the oil is ready for the "winterizing" treatment. In view of the fact that corn oil is considered a natural salad oil, some may wonder why this step is necessary. But it happens that although corn oil does not contain any easily separated stearine, it does contain less than 0.05 per cent of a wax having a high melting point which slowly separates from the oil on standing, giving it a dull hazy appearance.

So the oil is chilled to a low temperature by refrigeration, mixed with a small quantity of filter-aid, and filtered once more. Sometimes the winterizing of corn oil is done after the final process of deodorization, but ordinarily it is better to winterize before deodorization, for then if there are minute traces of acid soaps in solution or any undesirable impurities, their complete removal can be effected at the same time, along with any traces of re-formed free fatty acids.

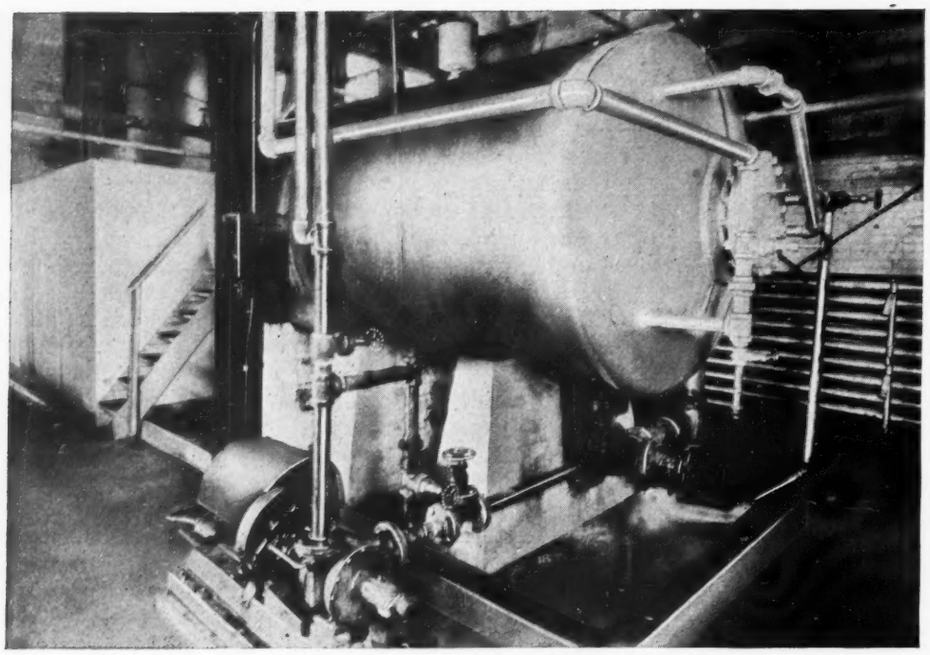
In the case of corn oil, unfortunately, the constituents having the characteristic odor, although present in small quantity, have a very high boiling point. Corn oil must be maintained at a high temperature, and under high vacuum, while pure steam is passed through the oil in order to render it bland and sweet. It is well to note that the vacuum functions as a means to protect the oil from the oxygen of the air as well as to lower the boiling points of the substances to be distilled from the oil. Owing to the temperature employed in this stage of the process, air leaks must be completely avoided, or strong, undesirable flavors will be developed in the oil through oxidation. This is true for all vegetable-oil deodorization work.

Several methods of obtaining the temperature are in use. The oldest method is the obvious one of closed steam coils, but excessive boiler pressures are required, and this is falling in favor. Direct circulation of the oil through oil- or coal-fired heaters gives any desired temperature but requires a rapid, turbulent flow of oil through the heater tubes and close attention to prevent local overheating. Another method of maintaining the temperature is by the use of circulating mineral oil in jackets or coils and back through an oil-fired heater. Proposed methods make use of electrical resistors immersed in the oil; another would circulate diphenyl for the transference of heat.

In recent years the vacuum ejection equipment has been rapidly coming to the front rank as a means of maintaining high vacuum conditions efficiently. An internal pressure of less than ½ in., and at times during the process still lower, can be obtained by the use of three-stage vacuum equipment in which the first two stages act as ejectors with a two-stage open condenser



Filter presses separate the oil from fullers earth and other agents for color removal



High vacuum tank in which the oil is cooled after deodorization

down-leg. The third stage of vacuum is accomplished by a so-called booster in which the kinetic energy of the steam acts as a direct means for aspirating the very large volume of expanded deodorization steam. The whole process of deodorization is varied to suit the variations in the oil.

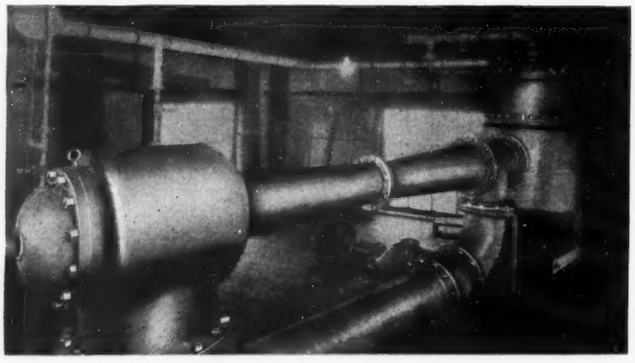
A good means of purifying the steam passed through the oil is by the use of small traps filled with many vanes to insure that all steam passing through will impinge on these vanes and particles of scale, soda ash, or pipe scale will be washed out by the steam that has condensed in the line.

There is a new form of steam superheater on which a patent is now pending, designed to condition the expanded steam before it passes through the hot oil. Multiple opposing jets strike against each other in a small chamber filled with standard hairpin-type heating elements, and the steam re-expands down along the elements on the way to the steam-spray distributor under the oil. Automatic thermostatic control of the current in the hairpin resistors makes it possible to control the superheat exactly, even though the steam may be at a fairly high vacuum when entering the oil. Electrical heat is expensive, but the thermal efficiency is high and it is much more economical to operate than an oil-fired superheater. It is called a recompression electrical superheater.

The interior of a deodorization tank is kept from becoming rancid when shut down by charging it with a fresh batch of cold oil to cool the interior up to the level of the oil, and the finishing vacuum of the preceding batch is maintained over the oil by a large valve on the outlet line. The leakage should be less than 20 millimeters during the first 24 hours after shutting down. By that time the upper portion of the deodorizer is quite cool and the danger of rancidity is very slight.

After deodorization the oil is cooled under a high vacuum and filtered through a filter press dressed with heavy paper. We now have an oil which is as near a pure glyceride as modern refining science can make it. If sealed away from light and air it will remain negative to the Kreis test for rancidity for an indefinite period of years. The residual free fatty acid content should be less than 0.03 per cent; usually it is down to 0.01 to 0.02 per cent. The color of the average corn salad oil is a light golden yellow, most often about 35 points of yellow and 5 points red when measured in the Lovibond tintometer. The official cold test requires an oil to withstand a temperature of 32 deg. F. for 5½ hours without losing brilliancy in order to be classified as a salad oil. Corn oil will withstand this and lower temperatures for an indefinite period, without showing a haze or stearine particles.

The smoking point for properly refined corn oil is 494 deg. F., which is considerably beyond any normal temperature employed for deep frying and 100 deg. higher than the smoking point of good lard. The significance of the smoking point lies in the fact that it indicates the breakdown of the glyceride molecule into less digestible substances.



Aspirator by which the high vacuum for deodorization process is obtained

Rigid Plant Routine Controls Fungus Growths

By J. H. RICHARDSON
Sanitary District of Chicago
Chicago, Ill.

THE optimum growing condition of molds is at a temperature of 80 deg. F., with a relative humidity of 80 per cent. The seeds of the mold, or spores, are ever present in the air and easily transported by air currents. About 3,000 plates exposed to the air yearly under all conditions of weather have shown that mold spores disseminate from the point of infection and gradually reach an equilibrium in a room infected. Any current of air serves to spread mold to adjoining rooms. A door, window, or even a small 2-in. hole in a wall, serve as very efficient entrance for contamination. Spores lodge in the smallest crevice of a smooth, painted surface of a wall.

Most of the edible-products departments of the packing house operate under optimum temperature and humidity conditions for molds at least a part of every year. Packing houses usually are located along a river. The humidity then favors molds both outside and inside of buildings.

A great variety of suggestions has been offered to bring about control of fungi. One suggestion calls for wrapping of the product. Several kinds of paper were used for wrapping bacon and hams—gray express, corrugated parchment, and glassine. The two former showed very high mold and yeast counts. The latter showed no mold and a few yeast growing on the paper. Some papers do not accelerate mold growth as much as others do. Another form of wrapping of meat products requires dipping the whole wrapped package in pitch. Many different styles of wrappings have been tried, but so far none is a success. Another suggestion to eliminate mold calls for dipping of the product in oil. This method affects the taste and appearance of the product, and if the oil is not watched very closely rancidity will result and the product soon spoil. Moreover, all of the suggestions named for wrapping or treating a product can never do more than inhibit mold growth. The mold spores already on the product are not affected.

There are many fungicides that kill mold effectively in the air and on surfaces, such as chloramine, hydrazine, and phenols. Thymol in alcohol is very efficient on surfaces for killing all mold growth and all spores. However, none of these, nor, as far as I know, any other fungicide, except sodium or calcium hypochlorite, can be used in a room with edible products. (See Table I.) Either a taint is left on edible products by absorption from the air or a poison forms by combination of the food product and the fungicide.

In addition to its use by meat packers, two other industries are using sodium hypochlorite with satisfactory results. The fish industry[1] of the northwestern part of the United States has experimented with hypochlorite in the ice in which the fish are packed as well as direct dipping of fish in sodium hypochlorite. Treating the ice has proved very successful in eliminating mold in shipments. Some kinds of fish are bleached slightly by this fungicide, but no harmful effects to consumer have been noted. A fresh, wholesome taste is noticed in fish dipped in hypochlorite of 0.2 to 0.4 per cent available chlorine.

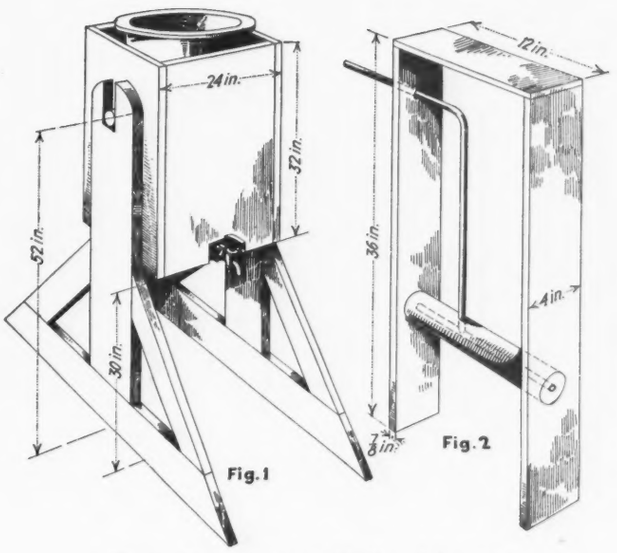


Fig. 1—Frame for hypochlorite mixing pot
Fig. 2—Stoneware apparatus for introducing liquid chlorine

The butter industry[2] has found that by the use of sodium hypochlorite instead of steam for sterilizing apparatus a mold-free product is obtained. Hypochlorite is especially effective in killing mold spores on butter wrappers.

Mold control has been in use in the packing industry for about ten years. For a long time it was more of an experiment than a practice; if a season had a particularly large loss by mold of bacon and hams, the department was sprayed with the hypochlorite fungicide and then forgotten. A slight bettering of the mold condition usually was noticed, but it was not pronounced. Spraying was generally done before the daily or weekly clean-up of the department, when there was an excess of organic matter present. The presence of this organic matter, such as bacon grease on slicing tables or ham grease on trimming tables, reduced the fungicidal power of hypochlorite probably 75 per cent.

When bacon began to be sold sliced and in packages, about three to five years ago, the surface exposed to fungi was increased 1,000 times or more. Moldy meats then began returning to the packer at an alarming rate. As the first step in overcoming the evil, sawdust, the greatest single mold contaminant, was removed from the floor. The air of the department was sprayed weekly with sodium hypochlorite (0.5 per cent available chlorine). Soon daily spraying of the department was begun. After a few months, sliced bacon, that had formerly kept only for three days before mold and spoilage appeared, lasted fifteen days.

Table I—Residue of Hypochlorite After Spraying

Sample Sodium Hypochlorite (NaOCl)	Solids (Per Cent)	Qualitative Analysis	Quantitative Analysis Sodium Chloride (Per Cent)	Sodium Carbonate (Per Cent)
No. 1. Amount of sample—1000 cc. water dilution 0.5 per cent available chlorine	2.01	Na, – Cl, – CO_3	86.50	13.35
No. 2. Amount of sample—1000 cc. water dilution 0.5 per cent available chlorine	2.02	Na, – Cl, – CO_3	84.00	15.75
No. 3. Amount of sample—1000 cc. water dilution 0.5 per cent available chlorine	1.62	Na, – Cl, – CO_3	86.50	13.24

Mold troubles have also appeared in the sweet pickle department of these plants. Wooden boxes and vats, found to infect the product, were sprayed carefully with the same sodium hypochlorite. The air mold counts in the export ham department that used these boxes soon began to improve. The meat packed in the boxes held as a test was found to be practically free from mold while the control box, not sprayed, was covered with mold. When curing vats were carefully sprayed after washing in hot water, the mold count was lowered further. A series of tests was run to determine a process of washing that would eliminate mold; in a short time this was accomplished.

We found most economical and practical a way of making up the hypochlorite for packing-house use to be by the gas method. Hypochlorite is made up in a battery of six 55-gal. stoneware pots. The alkalinity of the hypochlorite solution gives the faucets a tendency to stick. A large, durable faucet is much in need.

Protection of the attendant who makes the hypochlorite from chlorine gas is accomplished by a large exhaust fan attached to the room by an air duct from the roof. The walls and ceiling of the room are made airtight to prevent chlorine gas from escaping to surrounding rooms. Heavy tarred paper with a $\frac{7}{8}$-in. pine stripping placed on each side forms the walls and ceiling of the hypochlorite room of one of the large packers.

In order to insure a daily delivery of the best grade of hypochlorite, the jar or pot must be washed after each batch of hypochlorite is made. A large wooden frame was devised and made as shown in Fig. 1. These tilting racks have been in use for a year and a half now, giving very good service.

The next step in the making of hypochlorite is the assembling of a suitable chlorinating apparatus. This apparatus must be able to withstand the oxidizing effect of concentrated hypochlorite, and tests showed that even the best of the corrosion-resistant metals caused the hypochlorite to break down at a comparatively rapid rate. High percentage of caustic at the beginning of chlorination makes wood useless in two days of use.

The only alternative was to design a suitable apparatus and have it cast in stoneware material. Fig. 2 shows the form of this apparatus. This apparatus efficiently conducts the chlorine to a 12-in. alundum tube having $\frac{1}{2}$-in. walls. This tube breaks up the gas into innumerable tiny bubbles which are dissolved before they reach the top of the solution. The chlorine is conducted through copper tubing from the liquid chlorine cylinders to the chlorination apparatus of each of the six pots.

In making up the hypochlorite, 12 per cent by weight of 50 deg. Bé. caustic in solution is added to the 55-gal. pot; 7 per cent by weight of soda ash or sodium carbonate also is added, and the solution made up to 50 gal. It is found that better results are obtained when the sodium carbonate is added in solution. Chlorine is added until alkalinity appears and vanishes quickly, with alcoholic phenolphthalein as an indicator. The quantity of available chlorine can be raised to 15 per cent if a cooling system is installed in the pots in which the hypochlorite is made.

The concentrated hypochlorite is diluted with water in 45-gal. lots so that it titrates 0.5 per cent available chlorine. The dilute solution is trucked in paraffined wooden barrels to the departments where it is used.

It is very important that the dilute hypochlorite be used within a few hours after it is delivered to the department for use. No department is allowed to get more than it can use in one day. In the summer time, at 80 to 90 deg. F. with an 80 per cent relative humidity, the dilute hypochlorite loses from 0.1 to 0.3 per cent available chlorine in 24 hr.

A regular method of general sanitation accompanied by routine spraying of hypochlorite is set in practice when a department is put under mold control. Every room of the department is inspected. Signs of visible mold or yeast are noted and the condition of walls, posts, and ceilings, is observed. All openings such as doors, windows, and holes in walls about pipes also have a definite relation to the possibility of keeping the department under sanitary conditions.

After this preliminary inspection, the next step is a bacteriological inspection with glucose-agar culture media. Several petri dishes are placed strategically on the floor in every room of the department, and exposed for 15 min. Sterile cotton swabs are rubbed over all surfaces, and petri-dish culture media inoculated from the swabs. Walls, posts, ceilings, all apparatus of every description, wooden and metal, and finally the products of the department are examined for fungi. These inspections usually are carried over a period of three consecutive days. It requires 48 hr. for the fungi to incubate at 80 deg. F. Counts are then made of all plates.

A definite standard of judgment is reached by the use of the following key to fungi condition of the department, based on experience:

Mold	Yeast
$A_1 = 0$	0
A = 0-3	0-3
B = 4-12	4-12
C = 13-25	13-25
D = 26-100	26-100
E = over 100	over 100

If a department has rough, unpainted wooden walls or walls whose paint is cracked and half gone, then a general clean-up is first required. The walls are scraped smooth and painted. Painting has proved one of the best means of eliminating mold present on walls and of furnishing a smooth surface easily cleaned and sterilized and is made a matter of regular-interval routine. Every sanitary precaution that will eliminate organic matter is made a matter of daily routine. All waste products, paper or wood, are kept in receptacles and removed daily from the department. Of course, all sawdust is eliminated, for it is impossible to have mold control with sawdust present.

After the rooms of the department are cleaned up at the end of the day, and all apparatus and floors are washed, spraying begins. The dilute hypochlorite is applied to the air and surfaces by means of a hand spray pump. In order to obtain the best results, a spray body must not be either too finely vaporized or too full of large droplets of hypochlorite. Some experience with power-driven spray pumps, built for experiment, makes it evident that so far no nozzle has been perfected that

compares with the angle nozzle used on the hand pump. The power-driven pumps used for experiment would not give a constant body to the spray.

The spraying is a two-man job. One man operates the pump and moves it around to points of advantage. The other man starts at one side of a room and sprays back and forth, backing as he does so, covering a swath 8 to 10 ft. wide across the room. The sprayer repeats this action systematically until the whole department is sprayed. An 8-ft. length of $\frac{3}{8}$-in. pipe enables the sprayer to hold the nozzle a few feet from the ceiling and thus spray all the air below it. Of course, all walls, posts, and apparatus are sprayed in the same manner.

Faulty methods in spraying hypochlorite often result in practices that become sources of mold contamination. It has been found that far better results are obtained when every room and all mural surfaces of a department under fungi control are carefully sprayed once as a unit than when a little is done each day. Otherwise, the other rooms recontaminate the sprayed sections and bring about a worse condition of mold or yeast growth than before.

At first the routine of sanitation is followed by daily spraying until the fungi are cut down in frequency until *A* and *B* mold and yeast counts are obtained on the daily routine petri-dish results. Thereafter the need of spraying is determined by the petri-dish counts of air and apparatus.

It has been found that no one fungus can be used as a standard for judging the amount of infection for all departments. It is not safe to speak of mold control, because yeasts are then left out of thought, and it has been found that yeast control is the more important of the two in some departments. In an export ham department at a temperature of 33 deg. F. it is easy to spray with sodium hypochlorite three or four days a week and get *A1* and *A* mold counts on the air and surfaces, but *D* and *E* counts of yeasts will be found. It is the yeasts that are hard to eliminate in ham curing by pickle solutions in vats. The hams also show an *A* count on molds and a *D* or *E* count on yeasts. In a box storage room in the smoked meats department, if the meat packing boxes are swabbed on a glucose-agar petri dish, a count of *D* and *E* is found of molds and only a few yeasts, *A* and *B* counts, occasionally. Plainly mold is the fungus to be used as a standard in the latter case.

In the sliced bacon department, the steel hand trucks on which bacon is trucked from the freezers to the slicing tables, the wooden wrapping tables, when carefully washed and scrubbed daily with sodium hypochlorite, and the hands and aprons of the girls who slice and wrap the bacon, very seldom show a mold count above *B*—usually an *A* mold count—but almost 100 per cent show *D* and *E* yeast counts. It is to be noted that yeast spoilage is by far in the majority in holding tests on bacon as compared to mold spoilage. The optimum vegetative possibilities determine the fungus to be picked as a standard.

At times a department that is under mold control will show a particularly high mold or yeast count. If this continues consistently for three days, a check is made of the daily sanitation routine and of the spraying of hypochlorite. If these two daily processes are functioning properly, then a careful study is made, by swabs and petri dishes, of all possible fungi contaminants.

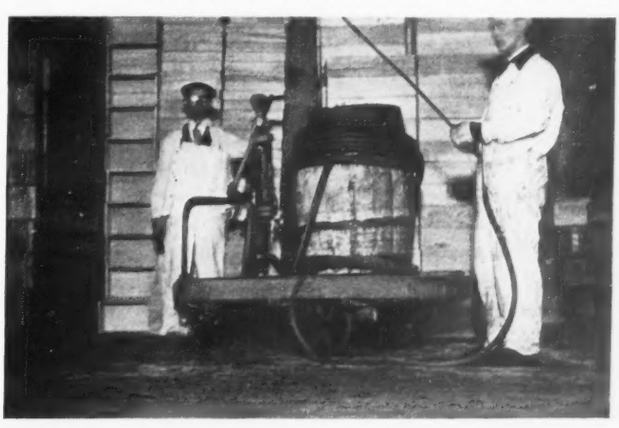
Such a problem arose in a smoked meats department. The problem was found to be caused by mold contamination. The boxes in which ham and bacon were packed gave very high mold counts, *D* and *E*, every time they were tested for two months. Open steel chutes, about 6 ft. wide and 2 ft. deep, extended in spiral form from the fourth floor box storage to movable conveyors on the second, passing through the third floor, where hams were stored prior to shipment after storage. By placing petri dishes of glucose-agar (0.5 per cent glucose) in various locations it was found that mold was sown through the entire ham and bacon hanging room and through the entire shipping room on the second floor where the chutes were in use. When no boxes were tossed for a day the low mold count was found. The problem could be solved by spraying of the storage room, by spraying the box before it leaves the storage room, and by partitioning of the chutes from the remainder of the rooms.

Another example of a contaminant is seen in some former difficulties in a butter department of a meat-packing concern. Although the salt content was found to be all right, the creamery room in good condition as regards daily sanitary clean-up, and all apparatus sterilized properly with sodium hypochlorite, the butter showed mold spots when the storage cooler was visited. However, the butter was found stored next to a post on which was visible mold. On the other side of the post, stacked along the wall was cheese, open and covered with visible mold. The problem was thus easily solved. The butter was stored in a separate cooler that was kept under mold control by the use of hypochlorite.

Another problem that sometimes arises in particular departments is illustrated by the oleomargarine department of a certain plant. The air system in the plant consists of a series of air ducts in which the air is sucked in by a fan equipped with wooden shutters through a water sprinkler and fanned out through the ducts. The method circulates the air again and again. A week after cleaning and spraying, *D* and *E* mold counts were again found. The whole system was seeded with mold; a Mucor was found very prevalent on the leaves of the air fan, and the air of the fan room showed the Mucor. The rooms the fan supplied with air showed the same Mucor present. About this time a sample of oleomargarine was returned moldy. The mold was found to be a Mucor. This gives an idea of the extent of contamination that an air system seeded with mold can cause. The trouble was cleared up, but such an air system demands constant vigilance.

A sliced-bacon department designed to provide proper fungi control (see Fig. 4) illustrates a number of principles of design and operation that must be kept in mind. Incoming bacon naturally carries some mold spores as a contaminant under the best of preprocessed conditions. To counteract this, the room through which the bacon enters the department has been provided with double

Fig. 3—Hand spray pump equipment used for routine spraying



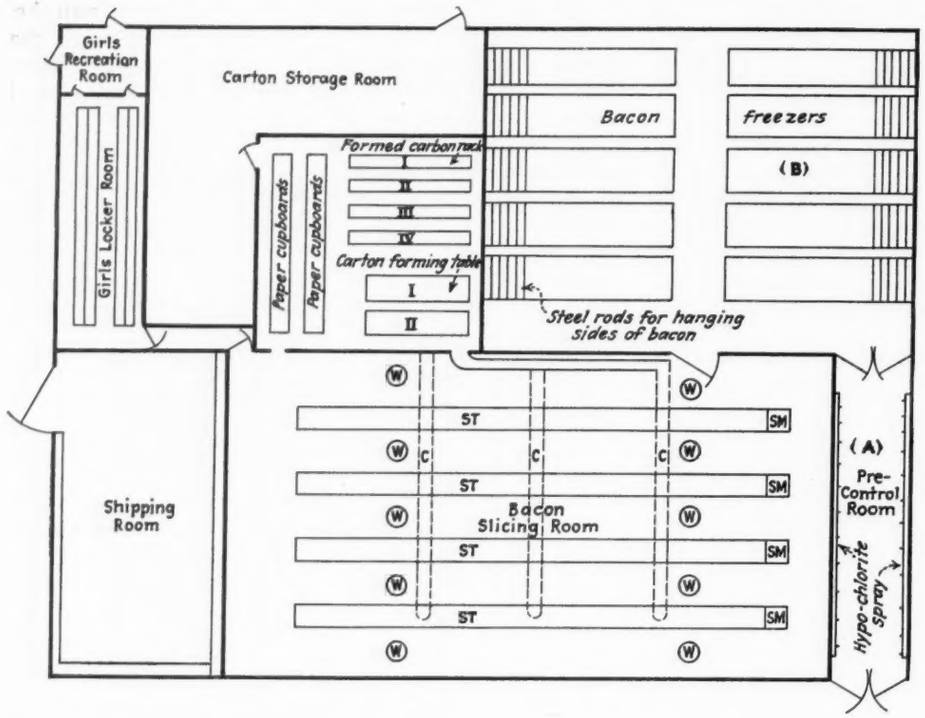


Fig. 4—Sliced-bacon room designed for proper fungi control

doors and a system of sodium hypochlorite spray units (*A*). Two ½-in. copper lines connected to a wooden barrel for hypochlorite extend the length of the room on either side, 8 to 10 ft. above the floor. Air lines furnish the atomizing force. This room should be sprayed as often as mold control tests advise, preferably just a few minutes before the trucks laden with bacon are to enter the department. The trucks full of the bacon should be opened and allowed to stand from 15 to 20 min. in this room at a temperature of 26 deg. F.

The bacon is next pushed into the freezer (*B*), and hung on metal rods. The plan devised for the freezer provides double bacon compartments, each 6 ft. wide, with an alley between each double compartment, so that a power spray machine may be operated over the entire room. The length of the spray pipe of the power machine will enable it to care for the whole room if the bacon is so hung. There are only two doors to the freezer, one from the sterilizing room and one leading into the slicing room. We advise no more openings. The walls and ceiling should be of plaster and the floors of cement or asphalt.

After the usual 48-hr. period in the freezer, the bacon goes to the slicing machines. The slicing room should have tile walls with a tile or plastered ceiling, if possible. We have maintained a very favorable condition of mold control with such walls and ceilings. A slicing room such as the plan shows should be provided with twelve to fourteen bowls (*W*), for washing the packers' hands, fitted up with solutions to sterilize their hands before drying with air dryers. Under supervision of a careful floorlady, the hands of the wrappers can be kept in a very sanitary condition. The continued infection of the transparent cellulose wrapping material with yeast, especially noticeable in the 6-lb. boxes, makes this necessary. In several tests, we found scarcely any mold but much yeast and grease. The slicing tables generally show a low mold count but a high yeast count. In order to speed up production and eliminate the handling with human hands of transparent cellulose wrappers and formed cartons, we suggest the installation of overhead conveyors. These overhead conveyors will carry the materials enumerated from a condition of mold control in the storage room to the particular table where they are to be used.

The bacon leaves the slicing room in a wrapped, sealed package. The package is placed on a movable conveyor which carries it into the shipping room. The packages are prepared for shipping and stacked on racks in this room. The racks are constructed so that plenty of room is left to spray underneath with sodium hypochlorite. A vacuum line paralleling the conveyors enables the workers to remove all lint and paper residue without sweeping the dust into the air.

In the carton storage room all paper is kept in cupboards which can be tightly closed. The paper cupboards, the wrapping sheets, and the individual packages for packing bacon are kept in a division of the storage room partitioned off from the rest of the room in a condition as free from fungi as possible.

The girls' dressing room has been provided with 72 lockers. The entire room has been so arranged that it can be sprayed along with the rest of the department. We believe no cleaning with a broom should be done in this room or any other room of the department. A vacuum cleaner will remove all dust and dirt much more efficiently and sanitarily, so that spraying can more fully accomplish its work.

From our past experience we believe that the air in all the rooms can be kept under mold control and be kept more sanitary by daily spraying with sodium hypochlorite rather than by any washing or filtering system that may be installed. The constant mold infection that accumulates on the leaves of air filtering systems overbalances the good they accomplish. The daily spraying serves as a means of cleansing the air as well as killing all microscopic life.

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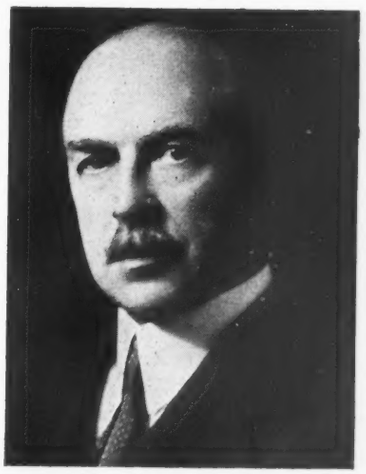
Some Trends in Distribution Organization and Method

By F. P. VALENTINE
Chairman, Committee on Distribution, American Section, International Chamber of Commerce. Assistant Vice-President, American Telephone & Telegraph Co.

As Told to O. Fred Rost



F. P. Valentine

ONE of the tangible results of the sixth congress of the International Chamber of Commerce, held at Washington, D.C., May 4-9, 1931 was the adoption of a resolution providing for a special committee of the chamber "to enlist national committees, interested public and private agencies, and individual experts in the field of distribution, to cooperate in an organized national and international effort *to provide accurate and basic data upon the entire problem of distribution.*"

A tremendous amount of effort has been expended by a few interested individuals in the gathering of data and preparation of the text of the impressive 178-page report on "trends in the organization and methods of distribution in two areas," which so effectively focused attention upon the subject and served as a stimulus to the final approval of the resolution.

As chairman of a special committee on distribution, F. P. Valentine, assistant vice-president, American Telephone & Telegraph Co., guided the preparation of the report on distribution in the United States. This report was afterward consolidated with and formed a major portion of the international report submitted to the Washington congress.

Mr. Valentine has been for a number of years closely associated with national and international studies of distribution. Not attached to any one distributing industry, he nevertheless represents interests that are genuinely and continuously concerned with distribution problems in that the company he represents provides an indispensable system of nerves of communication for all functioning branches of business.

He has been in a most exceptional position to observe trends in distribution practices both here and abroad. It is therefore extremely valuable to have his selection of particularly important sections of the international report previously referred to.

Mr. Valentine pointed out that right in the introduction to the report are some paragraphs that deserve widest possible publicity, because they will serve to create a better understanding of the reasons why distribution is so important a subject.

"Distribution," as discussed in this report, "covers the various activities and processes involved between the production of goods in final form for use and their delivery to and acceptance by consumers. The concept under which it is herein treated may be stated as follows: Fundamentally the very existence of all business organizations, and of all business activities, is based on the economic necessity of fulfilling the wants of ultimate consumers or users, or supplying them with goods or services which they desire and may be led to purchase. In the last analysis, it is the effective desire of consumers as expressed in their purchases which directs and regulates productive activities, both of society as a whole and of its individual elements.

"There is a particular and vital interdependence between production and distribution activities, not always recognized, but always existing, which, in the general interest, requires a high degree of coordination of all the agencies and activities involved.

"The thinking of all except consumers—and their thinking, when they are employed in production or distribution functions—is primarily concerned with the maximum production or distribution of the particular goods which they produce or distribute. Their primary concern really should be to fit their function into the economic mechanism that supplies consumers.

"In order to do this they first must know where the consumers are, what they consume, and in what quantity; also, they must know the methods of operation of the mechanism which stimulates and supplies the consumer's requirements. Such knowledge is necessary in order that their own planning and activities may effectively be correlated with the general economic mechanism.

"Therefore, it would appear that the primary responsibility of distribution agencies is to allocate and evaluate consumption, or demand. Errors in carrying out this responsibility inevitably are reflected back through all the agencies concerned in supplying specific consumption, resulting in waste either through overproduction or underproduction. Accuracy in carrying it out should regulate production, in the general economic interest."

Continuing, Mr. Valentine pointed out that the report brings together some significant data on population.

There is the increasing shift toward larger centers; the latter, in 1900 accounting for but 40 per cent, now have 56.2 per cent of total population. There is the significant increase in the percentage of those engaged in distributive or service functions from 4 to 5.2 per cent in eighteen years.

Retailing operations have changed radically in practically every line of trade. Considerable changes have taken place in the wholesaling branch of distribution.

"Formerly the typical wholesaler carried a wide assortment of everything in his general commodity line which retailers needed, although there were specialty wholesalers who carried a smaller assortment, in some cases confined to a single line. The shifting of retail trade toward the larger centers has tended to reduce the small-town retailer market and to increase the expense of selling to it.

"The increase in large-scale buying by chains, voluntary chains, department stores, and group buying organizations which deal direct with manufacturers has materially affected the independent wholesaler and has led to many realignments in wholesaling operations and organization.

"Manufacturers have opened branch warehouses and done their own wholesaling, in order to provide a more aggressive and effective performance of the function. Large wholesalers have established their own manufacturing plants for some of their lines, and sell their own brands of goods. Mutual wholesalers have developed, retailers making deposits against orders or becoming stockholders.

"Wholesalers have established controlled chains. Many have organized or joined voluntary chains. 'Cash and carry' wholesalers have been established in the grocery field, the retailer calling for and paying cash for the goods, which he transports to his own store.

" 'Wagon jobbers,' over 10,000 in number and operating more than 40,000 motor trucks, distribute a limited number of food specialties to retailers over considerable distances.

"There have been similar changes in the wholesaling of agricultural products, such as fresh fruit, vegetables, milk, eggs, hay and cereals for feeding, which are sold to consumers practically in their original form. These products must be assembled in quantity from widely scattered sources, mostly small in size, transported expeditiously over considerable distances, concentrated in central or terminal markets, and distributed in lesser quantities to retailers in scattered markets.

"There have been marked changes in the way of more efficient and larger scale production and in improved refrigeration in transit and at terminal warehouses; inspection, grading, packaging, specialized large-scale marketing of advertised quality brands, have stimulated consumer demand. The operations of large wholesaling organizations have been integrated with those of large-scale producers.

"Producers are becoming represented in larger marketing units in the form of cooperative marketing organizations, allied or competing with other organizations which perform wholesaling functions. Clearing houses and exchanges, 'futures' selling, alliances of the voluntary chain type, and other developments are typical of the trend toward more effective coordination of marketing operations."

Mr. Valentine also calls attention to some of the trends that have affected manufacturers and which, "together with the great increase in large-scale buying by chains, voluntary chains, department stores, mail order houses, group syndicates and mergers, have brought requirement for more direct interchange of information between the manufacturer and the retail outlets. The extent of this large-scale buying is difficult to measure; but it is estimated that the bulk of the buying of some 200,000 chain stores is concentrated in less than 8,500 chain headquarters.

"Manufacturers have a double responsibility, not only to organize and time the arrival of the raw material and supplies which enter into the manufacture of their product to synchronize with their manufacturing processes but also to endeavor to adjust both closely to the rate of flow of goods from retail outlets into consumption.

"In the case of some of the largest manufacturers, there is practically complete integration of operation and control from the raw material through the manufacturing and distributive processes to the final consumer. In some cases manufacturers control their own retail outlets; in others, chains of retailers own an interest in or control manufacturers; manufacturers have opened branch plants or distributing warehouses.

"Among the great variety of forms of relationship between manufacturers and wholesale and retail outlets there have been some especially significant developments indicating efficiency and profit in distributing through other than controlled outlets.

"Certain manufacturers have contracted with selected wholesalers for the exclusive wholesaling of their products in definite territories, and, through a committee elected by them the wholesalers participate with the managements of the manufacturers in determination of the policies and methods which will give the maximum market development, with reasonable profit to all concerned.

"In some cases a manufacturer has contracted with a chain of retail stores to distribute his product, billing the goods to them at cost at factory shipping door. The retail chain sells the products at standard prices, deducts the cost of its handling and selling them, and the balance, or profit, is divided between the manufacturer and the chain.

"In other cases, manufacturers have acquired through consolidation several other manufacturers of lines of complementary or non-competitive products which can be retailed through the same outlets, and serve these through one set of salesmen, in this way reducing distributive costs and having greater opportunity to improve the retailing of their commodities as a whole."

Mr. Valentine also stressed the need for more research and pointed out that, "with the increasing requirement for and dependence upon accurate market information and commodity and distributive process cost data, there is developing a keen appreciation of the need for uniformity of definition and terminology, of common denominators and units of measurements, in order to provide accurate and comparable data. This need has not yet been met adequately. Therein lies a real opportunity, if not an obligation, for active constructive leadership."

Furthermore, it is emphasized that these various trends in distribution "are developing the need for higher grade executive and well-trained subordinate personnel, which is one of the serious problems of the future."

It is regretted that only these few outstanding observations could be covered within the confines of the interview here recorded, but the conclusions of the committee, recorded in the report do, in the opinion of Mr. Valentine, its chairman, deserve the serious consideration of every executive.

The Wage Earner in the Food Industries

By EDWARD R. DEWEY

EVALUATION of the wage earner's part in any industry is difficult, as no recognized yardstick for measurement is available. Yet it is important to compare his part in one industry with that in another, in order to gage his relative performance and his share in the industry's income.

The first thing to consider in making a study of this sort is, what shall be considered as a suitable measure to show changes in output? We may think first of the value of products. We can say that in a certain year such and such a plant made $100,000 worth of flour and the year following made $110,000 worth. A little reflection, however, shows that value as a unit of measure is quite inadequate, because of the fluctuations in the value of the dollar. Perhaps the plant in question had the same number of wage earners in both years and produced the same quantity of flour of the same quality.

The alternative is the using of quantity figures; in other words, the measuring of output by the number of units of things produced—barrels, pounds, tons, or what not—regardless of the number of dollars for which these commodities may have sold in any given year. This plan is rather simple when one is considering the output of specific industries, all the plants of which make practically the same thing; but it complicates the matter when it becomes necessary to judge, for example, the change of productivity of all industries together, where some industries measure their output in pounds and others in gallons, and so forth. Despite this difficulty and despite other disadvantages, the physical volume of production is the best index to use for our purposes.

The three charts presented afford some basis for such comparison. From them one discovers that the food industries, measured in terms of physical quantity of goods produced per worker, did not change materially from 1899 to 1919. What change there was was downward, the average worker in the food industries in 1919 producing slightly less per year than did the worker in the food industries in 1899. During the last decade, however, there has been a rapid and substantial increase in the productivity of the people engaged in the food manufacturing industries.

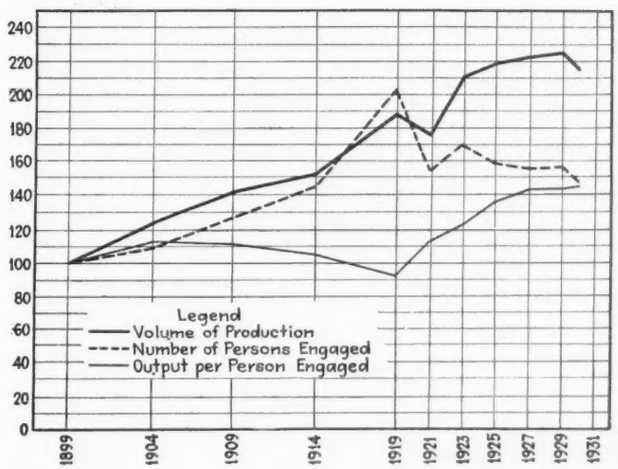


Fig. 1—Index of volume of production, number of persons engaged and output per person engaged, for food and kindred products. From Table II

The food industries are not alone in these tendencies. The index figures for all manufacturing activity from 1899 to 1929 show the same characteristics.

The productivity of the persons engaged in the different divisions of the food manufacturing industries, however, has not changed equally nor always in the same direction. For example, during the first two decades in this century the physical output per person engaged in the slaughtering and meat-packing industry declined by one-third, and the improvement of the present decade has not yet quite brought the output per person engaged back to the level of thirty years ago.

Table I—Operations of the Food Industries

Data from Bureau of the Census[1]

Year	Value of Products: Billions of Dollars	Value of Products: Index No. (1899=100)	Value of Products: Per Wage Earner	Value Added by Manufacture: Billions of Dollars	Value Added by Manufacture: Index No. (1899=100)	Value Added by Manufacture: Per Wage Earner	Number of Establishments (Thousands)	Wage Earners: Number (Thousands)	Wage Earners: Per Establishment	Wages Paid: Millions of Dollars	Wages Paid: Index No. (1899=100)	Wages Paid: Per Wage Earner	Ratio to Value of Product Per Cent	Ratio to Value Added Per Cent
1899	2.2	100	$7,285	0.42	100	$1,379	41	302	7.3	125	100	$415	5.7	30.1
1904	2.8	130	8,038	0.54	130	1,524	46	354	7.7	165	131	465	5.8	30.5
1909	3.9	179	9,567	0.75	180	1,822	55	412	7.4	209	167	505	5.3	27.8
1914	4.8	219	9,707	0.99	237	1,991	59	496	8.4	278	222	560	5.8	28.1
1919[2]	12.4	566	18,168	2.33	598	3,399	61	685	11.2	723	577	1,055	5.8	31.0
1921	8.2	374	13,185	2.14	514	3,426	52	624	12.0	744	595	1,192	9.0	34.8
1923	9.5	432	13,954	2.53	607	3,715	52	681	13.2	794	634	1,167	8.4	31.4
1925	10.4	472	15,669	2.66	640	4,023	48	662	13.8	791	632	1,195	7.6	29.7
1927	11.0	501	16,211	2.90	697	4,268	50	680	13.6	823	658	1,212	7.5	28.4
1929[3]	11.8	535	15,914	3.33	800	4,512	55	739	13.5	882	704	1,194	7.5	26.5

[1] Data for 1919 and preceding years includes returns from many small establishments not canvassed in 1921 or later.

[2] Values for 1919 are often outside the limits to be expected from the trends, because of "boom" prices of that year.

[3] Data for 1929 are all preliminary and subject to revision.

Table II—All Manufacturing Industries Operations

Data from Bureau of the Census[1]

Year	Value of Products: Billions of Dollars	Value of Products: Index No. (1899=100)	Value of Products: Per Wage Earner	Value Added by Manufacture: Billions of Dollars	Value Added by Manufacture: Index No. (1899=100)	Value Added by Manufacture: Per Wage Earner	Number of Establishments (Thousands)	Wage Earners: Number (Thousands)	Wage Earners: Per Establishment	Wages Paid: Billions of Dollars	Wages Paid: Index No. (1899=100)	Wages Paid: Per Wage Earner	Wages Paid: Ratio to Value of Products Per Cent	Wages Paid: Ratio to Value Added Per Cent
1899	11.4	100	$2,420	4.8	100	$1,025	208	4,713	23	2.0	100	$426	17.6	41.6
1904	14.8	130	2,705	6.3	130	1,150	216	5,468	25	2.6	130	477	17.6	41.5
1909	20.7	181	3,125	8.6	177	1,290	268	6,615	25	3.4	170	518	16.6	40.2
1914	24.2	213	3,446	9.9	205	1,400	276	7,036	25	4.1	203	580	16.9	41.3
1919[2]	62.4	547	6,862	25.0	518.4	2,750	290	9,096	31	10.5	525	1,158	16.9	42.0
1921	43.6	382	6,282	18.3	379	2,640	196	6,944	35	8.2	408	1,181	18.8	44.7
1923	60.5	531	6,896	25.8	535	2,950	196	8,776	45	11.0	548	1,254	18.2	42.6
1925	62.7	549	7,476	26.8	554	3,190	187	8,381	45	10.7	534	1,280	17.1	40.1
1927	62.7	550	7,511	27.6	571	3,300	192	8,350	43	10.8	540	1,300	17.3	39.3
1929[3]	69.4	609	7,940	31.7	656	3,620	207	8,743	43	11.4	569	1,306	16.5	36.1

[1] Data for 1919 and preceding years includes returns from many small establishments not canvassed in 1921 or later.

[2] Values for 1919 are often outside the limits to be expected from the trends, because of "boom" prices of that year.

[3] Data for 1929 are all preliminary and subject to revision.

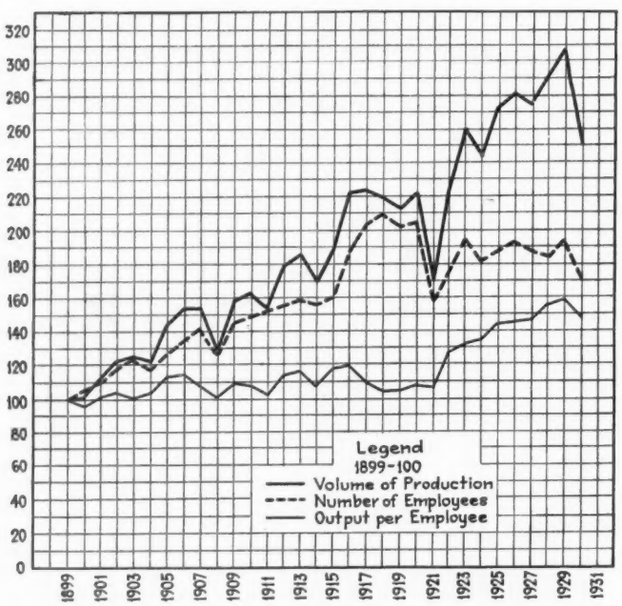
Similarly, the output per person engaged in the flour-mill and grain-mill products industry decreased from 1899 to 1919 by one-quarter, and although the recovery in the following ten years has been rapid, the output per person engaged is even now only 15 per cent greater than at the beginning of the century.

In striking contrast to these industries are the changes that have occurred in the canning and preserving industry. Advance in output per person engaged began from the very start of the century and continued, until 1929, almost without break.

Many other factors affecting the wage earner in industry could be considered, including the value of the products per wage earner, the valued added by manufacture per wage earner, and the wages paid per earner.

There has been a well-marked tendency to increase the size of individual manufacturing establishments, which should, of course, be reflected in the number of wage earners employed per establishment. Statistically, this trend is evident until about 1923, at which point the development seems to have been arrested. This does not indicate that establishments have not been growing in size during recent years. It indicates, rather, that there have been springing up considerable numbers of new sorts of establishments, thus maintaining about a constant average size.

Fig. 2—Volume of production, number of employees, and output per employee, all manufacturing activity, 1899-1930 inclusive, with 1899 = 100



A second factor of substantial importance can perhaps best be gaged by a consideration of the ratio of wages paid to the total value added by manufacture. That ratio indicates the percentage of total manufacturing costs and profits which goes to compensate the wage-earning employees. That percentage has varied somewhat during the past thirty years, but apparently has not ever greatly changed from an average of approximately 30 per cent. Thus it is evident that although largely

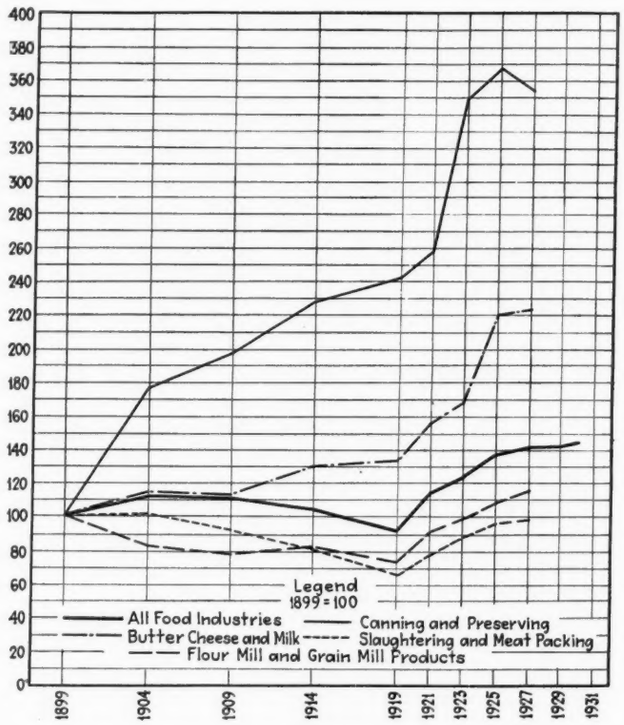


Fig. 3—Index of output per person engaged for all food industries and for four leading food industries, 1899 to 1930 inclusive, with 1899 = 100

increased investments had to be carried, the wage earner has still maintained, at least until the last few years, his share in the total increase in value added by manufacture.

The two tables of data relating to the group of food industries and to all manufacturing establishments will permit a number of analyses to be made. Warning is again given that in such analyses one should be certain not to overrate apparent statistical indications by neglecting some important factor such as the variable purchasing power of the dollar.

Mr. Dewey, the author of this article, is chief of the industrial marketing division, Bureau of the Census.—Editor.

Retaining Vitamins in Tomato Juice Manufacture

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THE vitamin content of tomato juice is by no means its only virtue. It is equally true, however, that the vitamin story has been largely responsible for bringing the use of tomato juice into prominence. Unless tomato juice measures up to expectations as to the vitamin content that brought its use into vogue, its popularity will suffer. This is particularly true in hospitals and for infant feeding. The reputation it wins for itself in such use will play a large part in its status in other circles.

It is appropriate, therefore, to review available data on the vitamin content of tomatoes and tomato products in so far as it throws light on the tomato-juice problem. It is quite common for a food product to be fairly rich in some one of the vitamins, but it is outstanding for a food to be among the richest sources of the three most common and first discovered vitamins, A, B, and C. In the book, "Chemistry of Food and Nutrition," by Henry C. Sherman, professor of chemistry at Columbia University, units have been assigned to various food products which classify them with respect to their relative vitamin content. Orange juice has been widely used as a standard source of vitamin C; it was long recommended as the best source of vitamin C to supplement milk in infant feeding. Because it has recently been recommended that tomatoes may replace orange juice, the following figures from Prof. Sherman's book are of interest:

VITAMIN A
Orange Juice 350
Tomatoes, raw or canned—2,700

VITAMIN B
Orange Juice—"about" 150
Tomatoes, raw or canned—130-250

VITAMIN C
Orange Juice—150-300
Tomatoes, raw or canned—150-300

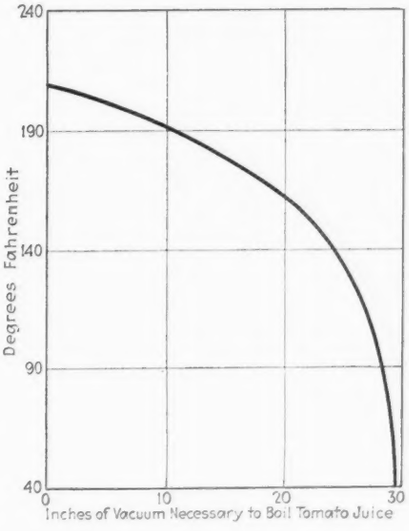
Dr. William Weston, in the *Journal* of the American Medical Association (Vol. 95, p. 834), quotes Dr. Alfred Hess from his book on scurvy as making the statement that infants can take twice as much tomato as orange without causing digestive disturbances. At the same time, Dr. Weston gives the following table comparing the relative mineral content of oranges and tomatoes:

	Iron	Manganese	Copper
Oranges	70.5	7.6	4.75
Tomatoes	160.0	26.7	15.3

Dr. Weston does not give the source of his figures, but as the salts of these minerals are regarded as desirable in the diet, the advantage of tomatoes in this direction is self-evident. It is apparent that tomato juice has ample opportunity to make even greater inroads on the popularity of orange juice.

We have made a study of the vitamin content of tomatoes and tomato products in various forms. This is published in an article in *Industrial and Engineering Chemistry* (Vol. 22, pp. 10-15, 1930), under the joint authorship of E. F. Kohman, W. H. Eddy, and Celia Zall Gurin. In this article, previous findings by others that vine-ripened tomatoes are superior to artificially ripened tomatoes and that canned whole tomatoes retain practically their full vitamin content, are confirmed. It is pointed out that the vitamin A content of tomatoes is practically unaffected by the commercial processes to which tomatoes and tomato products are commonly subjected. It is largely removed with the pulp by filtering, however.

The vitamin B content of tomatoes apparently is affected by only certain processes where excessive exposure to oxygen takes place. Vitamin C apparently is quite stable to heat if oxidation is avoided. Any process that introduces air will result in destruction of vitamin C in proportion to the exposure to oxygen and the temperature to which the product is subsequently heated while oxygen is present. Bringing cold-processed cyclone juice to boiling destroys a part of the vitamin C. In the study referred to, this amounted to about one-half the vitamin C present. Subsequent concentration of the cyclone juice to two-fifths of its volume by open-kettle boiling, or to one-fifth of its volume in vacuum requiring continuous, long heating apparently causes no further vitamin C destruction. The preliminary destruction before the boiling point is reached is due to oxidation by air incorporated by the cyclone. Vigorous boiling removes all air in a very short time.



No device so far available will extract the juice from whole tomatoes without incorporating more or less air. As tomatoes enter any hopper or opening to any juicing equipment, more or less air is entrapped. The viscous nature of the macerated tomato and the colloidal properties of the juice will hold entrapped air with a tenacity that will not permit it to escape except under a vacuum or by heating. The latter causes vitamin C destruction.

Even if no air is entrapped, tomatoes normally contain some oxygen. The question may arise in many minds as to why the oxygen naturally in tomatoes does not cause destruction of vitamin C in a sound whole tomato, inasmuch as it is so susceptible to oxidation. The answer is that vitamin C in its natural environment in the sound plant cell is relatively stable. That the vitamin C of raw whole potatoes is relatively stable is evidenced by the efficiency of raw potatoes in preventing scurvy on early long sea voyages.

There is reported in the literature an experiment designed to determine whether the vitamin C in raw potatoes resided in the juice or in the pulp. For this purpose, potatoes were ground and the juice was expressed and fed to guinea pigs, and was found to be very disappointing in its vitamin C content. The pulp was fed to other guinea pigs and it too was found to be just as inadequate. Thereupon, the pulp and juice were recombined in their original proportion and fed to other guinea pigs. The mixture was found to be no better than the juice or the pulp separately, although it was fed within 2½ hr. after the process was begun. In short, the process of pressing the juice from potatoes resulted in the destruction of vitamin C.

In explanation of this, it should be realized that every living plant cell contains enzymes which bring about chemical changes. The life processes are such chemical changes, and involve both oxidation and reduction. When the plant cells are ruptured, as is the case in expressing the juice, the enzymes become particularly active and apparently one of the reactions which takes place is the oxidation of vitamin C, which in the sound plant cell is relatively stable. After a tomato is macerated and the juice extracted, the oxygen that was without effect in the sound, unbroken tomato cell may result in entirely different consequences. Wildman (*The Canner*, December, 1930) has shown that marked chemical changes are in evidence within 6 to 10 min. after macerating tomatoes.

Vine-ripened tomatoes such as are used for canning have been shown to be superior in vitamin content to artificially ripened tomatoes. It has been demonstrated that in canning tomatoes, the vitamin content is practically all retained. The juice of canned tomatoes will therefore be the standard of judgment for canned and bottled tomato juice.

Because there is at present no device to extract the juice from tomatoes without such juice having more or less oxygen in it, and because heating such juice to eliminate the oxygen will cause destruction of vitamin C, it is obvious that some other means of eliminating it must be employed. The only alternative at present known is a vacuum applied to the juice. As the raw juice of fruits and vegetables, even though no air is incorporated beyond that normally in the cells, still undergoes relatively rapid changes, it is urgent that tomato juice must be promptly canned or bottled and sterilized—not alone to destroy microorganisms but to destroy the enzymic processes which bring about rapid changes without any growth of bacteria or similar microorganisms. This necessitates a continuous process for the production of tomato juice. By continuous process is not meant one in which juice is accumulated in one container during a certain operation while juice previously accumulated is being disposed of through another operation. By a continuous process is meant a system in which the tomato—within a few moments, or at least within a few minutes—is converted into juice, and the juice sealed in a container and subjected to the pasteurizing or sterilizing process.

The accompanying sketch embodies the general principles of a process in which the tomato juice immediately upon leaving the extractor is subjected to sufficiently high vacuum to remove all the air. In order to be fully effective, this vacuum should be sufficient to cause the liquid to boil. Otherwise, the air in solution is not completely removed. A liquid will boil under vacuum the more easily, the higher its temperature. If the tomatoes are somewhat warmed during the extraction process, any incorporated air will be the more easily removed in the vacuum. If the elevation in temperature is moderate, it is not likely that its effect will be noticeable within the few moments required to subject the juice to a vacuum. As the heat applied to tomatoes in the canning of whole tomatoes does not destroy the vitamin C, and no noticeable loss in vitamin C occurs during extensive boiling in the concentration of tomato pulp, although there is considerable loss in bringing it to boil, heating tomato juice for sterilization after thorough removal of air should cause no appreciable loss of vitamin C. Because of the liquid nature of tomato juice, less heat application is necessary for sterilization than is the case with canned whole tomatoes.

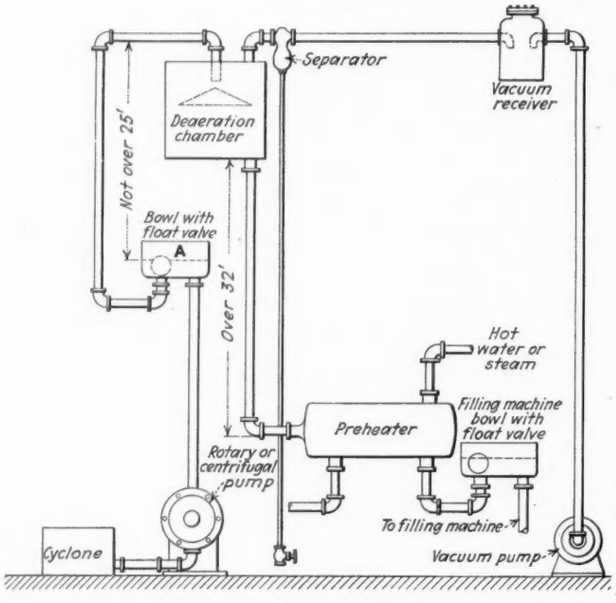
The question of tomato juice can hardly be disposed of in any discussion without considering the subject of homogenizing or viscolizing, which some regard as necessary to hold the insoluble solids in proper suspension. According to Mr. Winters, in an address before the tomato section at the annual convention of the National Canners' Association in 1931, subsequently published in the trade papers, a juice made from prime vine-ripened tomatoes shows least tendency to separate. If the juice is subjected to a homogenizing or viscolizing process, less of the insoluble matter can be included, as an excess will result in too thick or heavy consistency, and a product that can more appropriately be eaten with a spoon than used as a beverage results. By removing a certain portion of the tomato pulp or insoluble solids, a corresponding amount of the vitamin A is likewise removed, as the vitamin A is largely in the insoluble solids or pulp.

It is in vitamin A content that tomatoes are so markedly superior to oranges. This affords a selling advantage to the producer of tomato juice. It is worthy of serious consideration how far a process is to be employed which will tend to minimize this selling point. The settling that occurs in a good tomato juice not homogenized or viscolized is corrected by the shaking involved in opening the container. When this settling is in evidence before the container is open it is most objectionable. The producer of tomato juice will do well to make the most of a 2,700 to 350 ratio in the vitamin A content of tomatoes and oranges.

Sherman and Smith, in the second edition of "The Vitamins," just out, state: "As the result of his extended investigation of the dietary properties of the various types of food, McCollum concluded that dietaries deficient in vitamin A and in calcium content are of relatively frequent occurrence; that such deficiencies lower the vigor of the body and its ability to resist disease; and that as the result of such weakening there develops an increased susceptibility, so that the incidence of any of a number of diseases (of which tuberculosis serves as the outstanding example) may be largely influenced by the adequacy of the diet as regards vitamin A." Sherman has expressed similar views.

There is grave danger that the production of tomato juice will outstrip the developments necessary to bring such production to a state of perfection expected by the consumer. If this comes to pass, the producer of the best tomato juice will find himself obliged to sell a meritorious product in which the consuming public has had its confidence shaken. It is to give suggestions for the manufacture of tomato juice standardized to yield the best possible quality that the accompanying sketch is offered. In general, the sketch is self-explanatory. A few suggestions may be made for emphasis. Bowl *A* should not be a reserve tank but have a capacity only sufficient to operate a float valve. The de-aeration chamber likewise should be of only small capacity, possibly 25 or 50 gal. With the barometric leg sufficiently over 32 ft., the filling bowl will overflow before juice accumulates in the de-aeration chamber.

The efficiency and ease of the de-aeration will be considerably influenced by the thinness of the film of juice as it flows over the cone-shaped device upon entering the de-aeration chamber. The area of this cone should be as large as practical to assist de-aeration. Considerable attention should be given to the preheater, whether this should be steam-jacketed, water-jacketed, or whether the heating may be accomplished better with tubes similar to those used in the pasteurization of milk. If the filled cans or bottles are closed under sufficiently high vacuum, the preheater may be omitted. This may be the best solution of the problem. However, a vacuum closing machine will not remove the oxygen from the juice but will serve only to prevent trapping air in the container at the time of closing, and obviate the necessity of a preheater. Naturally, non-corrosive equipment is essential. Finally, it is to be noted that this is merely a suggestion and does not represent a process that has been tried out in making tomato juice.



Suggested layout for continuous de-aeration of tomato juice

Canning Tests Prove Presence Of Thermophiles in Sugar

By E. J. CAMERON and J. YESAIR

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IN 1926 it was first discovered that thermophilic spoilage bacteria were to be found in refined cane and white beet sugars. Since that time, there has been a growing realization that the bacterial condition of sugar is an important factor in the canning of peas, corn, and of other products of low acidity.

Both the canning and sugar industries have been working to eliminate sugar as a source of undesirable contamination, and it is felt that substantial progress has been made. No little credit for this is due to the several sugar producers who have assumed independent research in this connection. Some sugar producers expect, in 1931, to be able to supply canners with sugar of guaranteed suitability.

The purpose of this paper is to give the outstanding results of some experimental work which was designed to demonstrate in a tangible way the effect that highly contaminated sugar may have when used in canning corn.

It is to be recalled that most of the earlier reports on this subject have stressed the point that the effect of the use of contaminated sugar usually is indirect. In other words, the contamination brought by the sugar may inoculate some part of the canning equipment and, when favorable conditions exist, this contamination may develop to a point where it becomes a potent source of spoilage bacteria. This indirect effect is well illustrated by observations on the cause of high contamination found in some wooden tanks.

It has been impressed upon us, however, that sugar at times may be so highly contaminated that it may lead directly to trouble from spoilage. This possibility is of material importance. The canner may, by proper control within the canning factory, reduce to a minimum the possibility of a small amount of contamination being built up: but where the sugar which is used is of high contamination, he has no means to control the situation.

There are three general groups of thermophilic, spore-forming bacteria which are important as causes of spoilage: (1) The flat sour bacteria, which produce acid without gas, giving rise to the so-called flat sour spoilage; (2) the thermophilic anaerobic bacteria, which produce acid and gas and cause the can to become a "swell"; (3) the sulphide spoilage bacteria which are also thermophilic anaerobes, but which differ from those just described in that hydrogen sulphide gas is produced. This gas produces a general blackening of the can contents and the odor is suggestive of rotten eggs. The hydrogen sulphide gas is very soluble and the can does not swell.

These thermophilic bacteria grow best at temperatures in the neighborhood of 130 deg. F., and some of them require temperatures above 100 deg. F. in order to grow at all. Their importance to the canning industry is bound up with the high resistance of their spores to heat. In some instances, this resistance is so great that it is not practicable to destroy them by the process and they are prevented from developing by adequate cooling measures.

In 1930, during the operation of the field laboratory, it was found that several canners were using a sugar which contained all three groups of the bacteria just described. This sugar was particularly high in contamination by the flat sour bacteria. The sugar was under the same brand name in all cases and, as far as could be determined, came from the same source.

Laboratory tests included "spore counts" and heat-resistance tests. It was found that spores of the flat sour bacteria were often present to the extent of more than 2,000 spores per 10 grams of sugar. Since it is felt that a suitable sugar should carry not more than 75 spores per 10 grams, the contrast is apparent.

The heat-resistance tests on flat sour spores, which were in the contaminated sugar, showed that in dilute pea puree the resistance was between 145 and 150 min. at 239 deg. F. (115 deg. C.). In liquid taken from canned corn, the resistance was between 70 and 80 min. at the same temperature. These figures illustrated that with the usual methods of canning, the bacteria would not be killed and reliance would have to be placed on adequate cooling. Further than this, it should be mentioned that the sugar obviously would be a constant source of danger in inoculating the canning equipment.

Several bags of this contaminated sugar were shipped to our laboratory for further work. Shortly thereafter, some corn was put up which carried all the usual ingredients except sugar, and, in preparation for the experiment which was to follow, the corn was incubated at a temperature of 130 deg. F. for a period of two weeks, in order that any cans of corn containing thermophilic bacteria could be eliminated.

The experiment consisted in recanning the corn in three lots; the first lot contained no sugar, the second contained a sugar which was considered suitable for canning, and the third contained the unsuitable sugar which has been described. The sugar was added in a proportion of about 5 per cent.

Corn from these three lots was processed 70, 80, and 90 min. at 250 deg. F. The process which has been suggested for No. 2 cans specifies 70 min. at 250 deg. F. After processing, all cans were incubated at 130 deg. F. for a sufficient period to cause development of thermophilic bacteria where they had not been killed by the process.

The general results of this experiment are shown in the following table:

Spoilage in No. 2 Cans of Corn Due to the Presence of Thermophilic Bacteria in Sugar

Processed at 250 Deg. F.	—Per cent spoilage in corn with:— No Sugar	Sugar A[1]	Sugar B[2]
70 min.	0	0	95.8
80 min.	0	0	75
90 min.	0	0	54.2

[1]Sugar A suitable for canning non-acid products—"Flat sour" count 60 spores per 10 grams sugar.
[2]Sugar B non-suitable for canning non-acid products—"Flat sour" count 2500 spores per 10 grams sugar.

From the results which are given, it is seen that the bacteria in the suitable sugar were destroyed by the 70-min. process, whereas 95.8 per cent of the cans containing the unsuitable sugar were not sterilized. Furthermore, even after 90 min. at 250 deg. F., which is 20 min. longer than the process suggested by the laboratory, more than 50 per cent of the cans had not been sterilized.

Probably none of this spoilage would have occurred at temperatures below 100 deg. F., because it was found that this sugar contained the "obligate" flat sour thermophiles for the most part—bacteria which would not grow below 100 deg. F. But the significant thing is that if a canner who used this sugar had uncontaminated equipment, he would still have been marketing a non-sterile product. If there were times at the height of the pack when cooling was inadequate, it would be expected that there would be spoilage in the pack. If the product were shipped to the tropics, it is not unlikely that spoilage would occur.

There has been a large amount of work done to reduce losses through spoilage in corn and other products. There also has been work done which has as its objective the development of ways and means of attaining total sterility in canned corn. It is obvious from this experimental work that total sterility cannot be obtained unless the ingredients of the product are free from the highly resistant thermophilic bacteria.

The canner has the means to guard against the spoilage hazard of contaminated sugar. He can ascertain whether the company from which his sugar is to be secured is cognizant of the present situation and whether it is prepared to provide sugar which it knows to be suitable for canning. When the sugar is received, the canner may assure himself regarding the condition of the various shipments by having samples tested by a competent laboratory.

Corrosion of Tin-Plate Containers*

A REVIEW

By E. F. KOHMAN

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THE first 22 pages of this report consist of a review of previous work on the subject. The next 46 pages are a record of experimental work done in laboratory corrosion experiments in which a buffered citric-acid solution was the corrosive medium; the corrosion of tin, of steel sheets used for the manufacture of tin plate, and a couple of the two metals, was studied. The last two chapters, or 20 pages, consist of a general discussion directed toward practical application. The results of a canning experiment on black and white cherries, and on prunes whose acidity was increased with citric acid are included.

Prior to the recent work of the authors of this bulletin, and that of F. W. Hirst and W. B. Adams, of the University of Bristol Research Station, Camden, little had been done on this subject outside of the United States. The review in the first 22 pages is, therefore, largely a review of work done in this country. It is a fair presentation, although a more intimate contact with conditions in the United States probably would have resulted in a somewhat different interpretation.

On page 2, it is stated that "the greatest trouble is caused by products of low acidity, especially fruits in syrup, ranging from about pH 3.5 to pH 4.5." Few fruits have a pH above 4, and this range would more accurately have been placed at pH 3 to 4. Later on, the following statement occurs: "Sour fruit, such as gooseberries and pineapples, rarely give trouble, and California peaches, pears, and apricots are also generally immune." No mention is made of the fact that none of the latter are packed in enameled cans in this country as a general practice, which goes a long way toward explaining the lack of trouble.

In discussing the relative proportion of hydrogen swells and perforations in different fruits, one important generalization is omitted. Low-acid fruits, ranging in pH from 3.5 to 4, packed in enameled or lacquered cans, tend to form perforations. Those nearing the higher pH value in this range frequently perforate with very little loss of the original vacuum. The more acid fruits packed in enameled cans, as well as the fruits packed in plain cans, tend to form hydrogen springers and swells rather than perforations. If acid is added to the low-acid fruits packed in enameled cans to lower their pH value appreciably, they lose their tendency to perforate, and are more likely to form hydrogen springers and swells.

On page 18, two viewpoints explaining the anodic condition of tin with reference to iron in canned fruits are presented. It is generally agreed that when a tin-iron couple is set up, there is a tendency for the tin originally to occupy the cathodic position, but before appreciable corrosion occurs, there is a reversal of potentials, tin becoming anodic and remaining so in the absence of oxygen with practically all fruits. Lueck and Blair are cited as explaining this reversal to be "due to a back emf. set up as a result of the high over-potential of tin. . . ." It is stated further that "these observations have been confirmed and extended at the Low Temperature Research Station."

No other evidence than this statement, however, is given to substantiate Lueck and Blair's interpretation, which introduces an entirely new picture into the electrochemical theory of corrosion. It assumes hydrogen on the surface of the tin in such condition as to enable it to act as a hydrogen electrode, whose solution potential is greater than that of iron. If hydrogen is able on the surface of the tin to produce the "back emf." suggested, some force must be found to account for the creation of this emf., because forces are not spontaneously generated. If the solution pressure of the iron in the couple supplies this force, then it is inconceivable that the force produced by the iron will subsequently about-face and overpower the solution potential of the iron by which it was created. The only alternative origin for this supposed "back emf." is the solution pressure of the tin. And this is arriving at our own interpretation that solution pressure of tin in a tin-iron couple exposed to most canned fruits is greater than that of iron. We do not believe it necessary to postulate an intermediary emf. of hydrogen on the tin anode due to over-voltage.

On page 76, the authors state that at higher acidity "the tin of the can is relatively immune from attack and there is little doubt that a condition of almost complete polarization exists." If this statement pertained to tin alone, we could subscribe to it. In a can, however, we are dealing with a tin-iron couple in which Morris and Bryan have themselves shown that the hydrogen escapes from the iron; and polarization on iron is by no means as "complete," as they put it, as it is on tin.

There is ample precedent for our explanation of the lesser nobility of tin as compared with that of iron. In this connection, it may be excusable to refer again to the textbook experiment in which a reversal of current is brought about in a copper-zinc couple by introducing into the medium potassium cyanide, which holds the copper ion concentration to such a low value that the copper becomes the anode. In close analogy to this, we have cited the fact that tin tends to be thrown out of solution by various components of most fruits. Even in the absence of complex substances which are known to throw tin out of solution, we have demonstrated that the solution potential of tin is appreciably increased by increasing the acidity. These facts afford ample explanation for the anodic condition of tin with reference to iron.

In connection with this discussion, Morris and Bryan state: "It is unfortunate that Kohman and Sanborn draw most of their deductions with regard to the effect of hydrogen-ion concentration on the corrosion of the tin-iron couple from determinations of the single potentials of tin and iron, and the relative corrosion of these metals, in contact and out of contact, in solutions of hydrochloric acid of varying strength and almost entirely outside the pH range found in canned products. . . ." This contradicts their own statement on a previous page that we used as corroding media grapefruit, pineapples, strawberries, blackberries, rhubarb, black cherries, and red, sour cherries. Moreover, in connection with our work on single potential measurements and our corrosion experiments with these products, we make the following statement: "The static potentials of two metals with a given medium do not necessarily show the relative rates at which they corrode, as corrosion is a dynamic process." We have all along recognized the limitations of potential measurements, which give only momentary conditions and cannot be made on metals in a couple. Our data with mineral acids and pH's beyond the range of fruits emphasize the relationship of pH and solution potential of tin.

The following statement occurs on page 18 in connection with a citation of work in which we found that tin becomes increasingly anodic to iron as acidity increases: "On the other hand, the work at the Low Temperature Research Station, which covers the pH range found in canned fruits, has shown that, in point of fact, the maximum corrosion of tin in the tin-iron couple takes place at hydrogen-ion concentrations met with in the less acid fruits; viz., at pH 4 or 5." As we have stated be-

*The Corrosion of the Tin-Plate Container by Food Products. By T. N. Morris and J. M. Bryan, Low Temperature Research Station, Cambridge (Food Investigation Special Report No. 40). Published by Department of Scientific and Industrial Research, London, 1931. 85 pp., 6x9¼; 29 figures, 18 tables; paper. Price, 1s. 6d.

fore, practically all fruits have a pH lower than 4.0. However, Morris and Bryan in this pamphlet give no data in which they have varied the acidity of any fruit product, or even studied corrosion in fruits of varying pH. All the corrosion experiments which they give us are in a buffered citric-acid solution.

With both buffered citric- and malic-acid solutions we found that the maximum amount of tin corrosion in a tin-iron couple occurred at approximately pH 4. This should not be interpreted to mean that the solution potential of tin reaches a maximum at this point. However, when the pH of prunes, for example, was varied over a similar range—that is, from pH 1.35 to pH 4.86—the pH being lowered by the addition of a number of organic acids and raised with sodium hydroxide, we found that the tin corrosion tended to increase over the whole range with a decrease in pH irrespective of the acid with which the pH was varied. It is apparent that conclusions with reference to fruits drawn from corrosion experiments with a simple medium, like buffered acid solution, are not always warranted.

Morris and Bryan polished their specimens, both steel and tin, with emery cloth. They bring out the fact that the coarseness of the emery cloth and the extent of polishing materially affect the corrosion results. They mention considerable variation among specimens in a given experiment and, for this reason, use as high as four to eight specimens.

Our experience on the effect of emery cloth was similar. Therefore, we discarded this procedure and subjected all of our specimens to a pickling solution comparable to that employed before the tinning process in the manufacture of tin plate. Since the concentration, time, and temperature of the pickling solution can be controlled, the personal element in preparing specimens can be completely avoided. We had no difficulty in obtaining reasonable checks among our specimens.

That the corrosion of lacquered cans bears a considerable resemblance to that of iron alone is stated on page 41. To this we must take exception. In an experiment to which Morris and Bryan refer we canned blueberries in untinned lacquered cans in comparison with tinned lacquered cans. Blueberries in lacquered tinned cans tended to perforate the can before forming hydrogen springers or swells, while in lacquered untinned cans no perforation of the can occurred, but hydrogen sufficient to strain or burst the seam formed.

On page 2 occurs the following footnote: "Fruits in syrup appear on the whole to give more trouble than fruits in water." This is in accordance with our own experience. On page 64, Morris and Bryan state it to be quite possible that our results bearing on this may be explained by "the presence of sulphides in the sugar." In view of the fact that the presence of sulphur dioxide in sugars as well as the effect on fruits canned with such sugars, has long been recognized in the canning industry in the United States, it is hardly to be presumed that we would conduct an experiment of this kind with sugar whose purity in this regard we did not check. In their work with sugars, Morris and Bryan find that an inhibiting effect is produced by sugars in a buffered citric-acid solution. They found greater inhibiting effect from beet sugar than from cane sugar, and state: "For this reason it seems likely, although it has not yet been proved in practice, that beet sugar will be found to have a greater value than cane sugar in canning." The ample experience in this country both with cane and beet sugar is sufficient evidence that if they are adequately refined and free from sulphur dioxide, this supposed difference will not be found.

In this connection our experiments have shown that the addition of water-extracted apple pomace to an acid solution has far more inhibiting effect on the corrosion of steel than is evidenced by the sugar in the experiments of Morris and Bryan. Every fruit contains both inhibitors and accelerators of corrosion. The inhibiting effect is sufficient to mask that of any properly refined sugar. We believe that certain components of fruits may exert simultaneously both an inhibiting and an accelerating effect. The large complex molecule tends to inhibit corrosion, while some particular group in the molecule, acting as an oxidizing agent or as a hydrogen acceptor, tends to intensify it.

The results of the one canning experiment carried out by the authors are embodied in the following table taken from the booklet:

To the syrup of the cherries, 0.3 per cent citric acid was added, while to that of prunes 0.5 per cent was added. If no perforations resulted from these fruits in lacquered cans without added citric acid, it is contrary to all our experience, commercial as well as laboratory. These fruits have a marked tendency to perforate, although a casual examination may not reveal the perforation, which may become "plugged," and the can may then become a hydrogen swell. If the cans are stored at high temperatures, or if the lacquering is inefficient, hydrogen swells may occur before perforations. It is possible that the total losses are recorded in the above table as hydrogen swells.

In a footnote to this table the authors state: "It is not advisable to use less than 0.3 to 0.5 per cent acid. If too little is added, the effect may be harmful instead of beneficial." It seems, and in our experience is, paradoxical that if increasing acidity is beneficial, increasing it too little may be harmful.

The experimental work in this pamphlet apparently is carefully controlled and significant. In our estimation, it does not warrant a number of the conclusions drawn, especially those pertaining to commercial conditions, for reasons which we have tried to point out above. There are still many things to be learned about the corrosion in canned foods. It is not safe to arrive at a satisfactory answer by speculation; this can be arrived at only by experimental efforts directed specifically toward the point in question.

Table XVIII—Effect of Adding Acid to Fruits of Low Acidity

Fruit	Storage Period, Months	No Acid Added: Plain Cans, Hydrogen Swells, Per Cent	No Acid Added: Lacquered Cans, Hydrogen Swells, Per Cent	Citric Acid Added: Plain Cans, Hydrogen Swells, Per Cent	Citric Acid Added: Lacquered Cans, Hydrogen Swells, Per Cent
Black cherries	6	..	75	..	Nil.
White cherries	9	..	64	..	5
Prunes	7	77	77	Nil.	Nil.

BOOK REVIEWS

MICROBIOLOGY. By Benjamin Franklin Lutman. Published by McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City, 1929. 490 pp., 6¼x9¼; 211 illustrations; cloth. Price, $4 net.

ONE who is philosophically minded and who has given thought to the place of bacteriology in the sciences and in the history of knowledge will often be struck by the fact that the newest branch of the biological sciences has received its greatest advances from the chemists and the medicos. And although it is a biological science, the contributions of the general biologists to bacteriology have been very much less voluminous than those of the chemists or the physicians.

Therefore, it is interesting to read a textbook of bacteriology from the pen of a biologist, for this angle of approach is comparatively rare. Prof. Lutman is a plant pathologist and is concerned largely with microbiological life as living entities and is less interested in their physiological chemistry and metabolic activities.

Although his work is a textbook for college beginners, it has a very refreshing and stimulating effect in drawing the reader back from the physiologico-chemical viewpoint, which is the primary interest of most industrial bacteriologists, to the fact that molds, yeasts, and bacteria are living things of great interest, despite the importance of their metabolic end products in the economy of human life. Its very strength, however, in this respect is also its weakness when the author discusses food preservation, and the reviewer regrets that so able a book perpetuates the now discarded ptomaine bugaboo when discussing the relation of microbiology to canning. He is respectfully referred to the works of E. O. Jordan, and of E. C. Rosenau, which have been published for several years.

Although he ascribes the preserving

power of smoke to pyroligneous acid, he could not have had access to the work of Hess and others at Halifax on the preservative action of smoke, which, unfortunately, was first published after the book was printed. Hess has shown that acetic acid and formaldehyde have the principal rôle in preservation by smoke.

And, since this review is primarily for the benefit of those interested in food technology, your reviewer believes it would be well to call attention to the drawing of the apparatus for determining the temperature of cans during processing and points out that the newer industrial technology calls for thermocouples instead of mercury thermometers in such studies.

One of the interesting features of Lutman's book is the multitude of portraits of the earlier investigators in the field of microbiology, which cannot fail to enhance its interest to students of the science. It is, however, a textbook of microbiology and not a reference book for the food manufacturer.

L. V. BURTON.

* * *

THE INCOME OF THE AMERICAN FAMILY. By Daniel Starch, formerly of University of Wisconsin and Graduate School of Business Administration, Harvard University. Published by Daniel Starch, Graybar Building, New York City, 1930. 23 pp., 8½x11; flexible. Price, $15.

THE size and source of the American family's income has been the subject of more "guestimates" than any other single factor in our economic and social structures. Some of the most recent of these estimates have stated that as high as 92 per cent of all American families have annual incomes of $2,000, or less. For a nation of about thirty million families, of which eight out of every ten support automobiles, these figures seem difficult to understand.

Everyone who has anything to sell is interested in the income of the American family as a means of evaluating the buying power of his market. A growing consciousness of the inter-industry competition for the lion's share of this income has stimulated the demand for some reasonably accurate determination of where the American family gets its income and how much it amounts to.

This, the third of the Dr. Starch studies, seems to be the first really extensive attempt to gather reliable information about such an important part of any merchandising plan. The author cautions that his findings are based upon approximately normal conditions of employment and business, and are the result of interviewing sixty-three thousand families in more than two hundred representative communities of all sizes.

In a series of interesting calculations based upon a wealth of data, the author quickly dispels some of the more popular impressions about the "average" family income, which, to the surprise of most people, is much higher than generally supposed. The section devoted to the relative purchasing power of incomes in various sized communities furnishes an answer to that age-old question of how much does the dollar buy in a small town as compared with what it will buy in New York City.

The number of earners contributing to the family income and the amount of their earnings is an interesting feature. Of particular interest is the part dealing with the incomes of farmers, whose return to prosperity is said to be so necessary for the recovery of general business. Figures are given to show the total annual income of American families and the number of families falling within certain income groups.

This book will prove a valuable addition to the library of any food manufacturer who is interested in analyzing his ultimate markets. R. F. BOGER.

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PATENTS, TRADEMARKS AND COPYRIGHTS. By Oscar A. Geier. Fifth Edition. Published by Richards & Geier, 274 Madison Ave., New York City, 1930. 128 pp., 6x9, cloth.

THE law and practice are covered clearly and concisely in this compact volume, which is published under the auspices of Richards & Geier, patent attorneys, with which firm the author is associated. The book is well arranged and the important subjects and captions are emphasized by boldface type. Tabulated information about foreign patents and trademarks facilitates quick reference. Throughout the book there is a wealth of crisp advice for inventors, manufacturers, and lawyers. Only about a year elapsed between the fourth and fifth editions. There is no charge for single copies of the book.

F. X. BURKE.

* * *

HANDBOOK OF COMMERCIAL AND FINANCIAL SERVICES. Published by Special Libraries Association, 11 Nisbet St., Providence, R. I. 1931. 96 pp., 9⅞x6⅝; paper. Price, $1.50 to members of the association; $2 to others.

THIS handbook, the only one of its kind, has been compiled by a national organization composed of the librarians of important banks, insurance companies, publishers, and other business concerns. It lists 214 important services giving the latest and best information on sales, business conditions, stocks and bonds, bank operations, and similar subjects. Each service is described according to the type of information offered, the cost, and frequency of publication.

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GOVERNMENT PUBLICATIONS

DOCUMENTS ARE AVAILABLE *at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.*

Tenderness Tests, by Victor B. Bonney and others. U. S. Department of Agriculture, Circular 164; 5 cents. Describes an apparatus for determining the tenderness of certain canned fruits and vegetables.

Cottage Cheese, by H. L. Wilson and C. S. Trimble. Mimeographed document from Bureau of Dairy Industry, describing the manufacture of low-acid, rennet-type cottage cheese.

Menhaden Industry, by Roger W. Harrison. Bureau of Fisheries, Investigational Report 1; 25 cents. A comprehensive description with economic discussion, statistics, and bibliography. Another document simultaneously issued deals with Vitamin D in Menhaden Fish Oils, by John Ruel Manning and others. Bureau of Fisheries, Investigational Report 3; 5 cents.

Nutritive Value of Fish Oils, by Esther P. Daniel and E. V. McCollum. Bureau of Fisheries, Investigational Report 2; 5 cents.

Fishery Industries of United States, by R. H. Fiedler. Bureau of Fisheries, Document 1095; 55 cents. A comprehensive statistical review giving data for the calendar year 1929.

Salmon Statistics, by W. H. Rich and E. M. Ball. Bureau of Fisheries, Document 1102; 25 cents. Statistical review of the Alaska salmon fisheries, Part II: Chignik to Resurrection Bay.

Canned Food Tariffs, by Roberta P. Wakefield and others. Bureau of Foreign and Domestic Commerce, Trade Promotion Series 114; 80 cents. Part IV of the Handbook of Foreign Tariffs and Import Regulations on Agricultural Products, dealing with Asia, Africa, and Oceania.

Alcohol Regulations. Bureau of Industrial Alcohol regulations. No. 2, relating to permits for the manufacture and traffic in intoxicating liquors for non-beverage purposes; 40 cents. No. 3, relative to the production, tax payment, and the like of industrial alcohol, and to the manufacture, sale, and use of denatured alcohol; 20 cents.

Federal Food Specifications. Issued by Federal Standard Stock Catalogue Board: Salad dressing, canned figs, Chili and Worcestershire sauces, and mincemeat; 5 cents each. From the Navy Department, available from the specifications section of that department: Ground mustard and black and cayenne pepper.

Color Measurement, by Raymond Davis and K. S. Gibson. Bureau of Standards, Miscellaneous Publication 114; 45 cents. Filters for reproduction of sunlight and daylight and the determination of color temperature.

Essential Oil Trade. A series of documents dealing with production and foreign trade throughout the world in essential oils, including those used in confectionery, chewing gum, flavoring extracts, beverages, and other food products. This material is being issued serially in mimeographed statements from the Chemical Division of the Bureau of Foreign and Domestic Commerce. The following parts are now available: No. 1, France; No. 2, Brazil; No. 3, Yugoslavia; and No. 4, French Morocco.

Salad Dressing Survey. Mimeographed document from Foodstuffs division, Bureau of Foreign and Domestic Commerce. Operations in 1930 of the industry making mayonnaise, salad dressing, and related products.

Selling Spices and Beverages. Merchandising Research Division, Bureau of Foreign and Domestic Commerce, mimeographed document containing two of a series of commodity studies from the Louisville grocery survey.

Sugar Beets, by S. B. Nuckols. U. S. Department of Agriculture, Circular 156; 5 cents.

Peanut Growing, by W. R. Beattie and J. H. Beattie. U. S. Department of Agriculture, Farmers' Bulletin 1656; 5 cents.

ABSTRACTS OF CURRENT LITERATURE

FILTERABILITY OF RAW CANE SUGARS. I—EFFECT OF VARIOUS FACTORS PRIOR TO PAN BOILING. II.—EFFECT OF PAN-BOILING OPERATIONS. J. C. Keane and H. G. Hill, *Industrial & Engineering Chemistry*, Vol. 23, pp. 421-27; April, 1931.

There is a correlation of colloid determinations with filterability of sugars, but uniformly reliable results have not been obtained. On a factory scale, over a 4-day period, the addition of phosphorus pentoxide equivalent to 0.008 gram per 100 cc. of juice caused the following effects: (1) materially increased lime consumption; (2) an increase of over 100 per cent in the filtration rate of the syrup; and (3) beneficial effects throughout the factory. While good filtering syrup is a requisite for making a good filtering raw sugar, variations in design or method of operation of pans may cause a decided difference in the filtering quality of the resulting sugar. The question of pan circulation, design, and operation should be the subject of further investigation from the standpoint not only of raw sugar filtration but of crystallization in general.

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LIME PRECIPITATION IN SUGAR MANUFACTURE. Emile Saillard. *Comptes rendus de l'Academie des Sciences*, Vol. 192, pp. 178-80; Jan. 19, 1931.

In the sulphitation of beet juice following the usual carbonation treatment, due allowance must be made for the fact that the ions combined with sodium and potassium to form soluble compounds in the original juice will have combined to some extent with calcium in the carbonation process, forming insoluble compounds. This liberates in the juice a certain quantity of free alkali (sodium and potassium hydroxides), with which the sulphur dioxide added in the sulphitation stage will react. It was found that the proportions in which added sulphur dioxide combines with the two bases favors sodium combination more and more as the sodium alkalinity increases. For equal calcium and sodium alkalinities in the same solution, calcium combination is favored more and more as the sugar concentration increases, and also as the quantity of sulphur dioxide becomes greater. It was observed also that sugar in solution tends to retard the oxidation of sulphites to sulphates (sulphurous to sulphuric acid). These findings indicate some of the conditions which should be observed by the manufacturers of beet sugar in order to get the best results in sulphitation.

EFFECT OF HIGH TEMPERATURES IN THE PROCESSING OF ICE-CREAM MIX. C. D. Dahle and G. S. Barnhart. *Ice Cream Trade Journal*, Vol. 26, No. 11; pp. 41-43. [From Chemical Abstracts, Vol. 25 (1931), No. 6; p. 1292.]

Processing the ice-cream mix at temperatures of 170 and 180 deg. F. decreases the degree of fat clumping, reduces viscosity and freezing time, and increases protein stability. The difference obtained between the temperatures of 170 deg. and 180 deg. F. is not sufficiently great to warrant using temperature much in excess of 170 deg. F. The greatest benefits to be had in using the high temperature result when the mix is both pasteurized and homogenized at the high temperature. Lowering the temperature of the mix to 150 deg. F. for homogenizing vitiates some of the advantages obtained, particularly when mixes heated to 180 deg. F. are cooled to a temperature of 150 deg. F. for homogenizing. The high temperature at which the mix is pasteurized has more effect on viscosity, overrun, and protein stability than high homogenization temperature, while high homogenization temperature has a greater effect on fat clumping than high pasteurization temperature.

* * *

CALCIFYING ACTION AND TOXIC ACTION OF LARGE DOSES OF IRRADIATED ERGOSTEROL. H. Simonnet and G. Tanret. *Comptes Rendus des Seances de l'Academie des Sciences*, Vol. 192, p. 586; March 2, 1931.

Animal experiments have shown the presence of definite toxic and calcifying factors in irradiated ergosterol. These factors are different from each other and may be demonstrated separately. The experiments further show the remarkable chemical stability of vitamin D, as well as its distinct stability toward heat.

* * *

EFFECTS OF THE HABITUAL USE OF TARTRATE AND ALUMINUM BAKING POWDERS UPON THE UTILIZATION OF FOOD IN THE RAT. Ruth M. Kraft. *Am. Journal Hygiene*, Vol. 12, p. 283-7 (1930). [*Chemical Abstracts*, Vol. 25, p. 988; March 10, 1931.]

Male albino rats were fed a mixed dietary containing baking powder residues that were prepared by moistening portions of two commercial powders and heating the moist mixtures to 103 deg. for one hour. Rats were fed from early life to sixteen months on diets containing approximately 2 per cent of the alum residue and 4 per cent of the tartrate residue. After sixteen months, coefficients of digestibility were determined in the conventional manner and, when compared with similar data from control animals, there was found to be no appreciable difference in the utilization of food.

* * *

RÔLE OF COPPER IN THE SETTING AND METAMORPHOSIS OF THE OYSTER. Herbert F. Prytherck. *Science*, Vol. 73; April 17, 1931.

The mystery of the chemical stimulant necessary for setting of oyster larvae has been solved by the discovery that copper salts from fresh-water streams entering the salt water are the essential factor. Concentrations as low as one part of copper to 25 or 50 million parts of sea water are effective in causing an immediate setting of the spat. In the river water studied, the copper concentration varied from 0.2 part to 1.25 parts per million. Setting always takes place most effectively for two hours after the turn of the low tide to flood, and is directly correlated with the copper content of the sea water.

* * *

DETECTION OF HORSE MEAT AS AN ADULTERANT IN SAUSAGE. F. M. Bolin. *Journal Amer. Vet. Med. Assoc.*, Vol. 31, pp. 163-170. [From *Chemical Abstracts*, Vol. 25 (1931), No. 7, p. 1599.]

A horse-meat extract anti-serum was found better than horse serum anti-serum for the detection of horse-meat adulteration in sausage. Rabbits immunized to a cooked product had specific precipitins for the uncooked specific protein, and at the same time had non-specific precipitins for cooked meats of different species. Meats heated at 15 lb. pressure for 10 min. were unsuitable as antigens for immunization purposes. Immature animals were unsatisfactory in the production of precipitins. Meats of closely related species were differentiated only by the length of time necessary for the reaction to occur.

* * *

PREPARATION OF ACIDOPHILUS MILK FROM MILK TREATED BY ELECTRICITY. E. D. Devereux. *Am. Journal of Public Health*, Vol. 20, pp. 1009-10. [From *Chemical Abstracts*, Vol. 24 (1930), No. 20, p. 5077.]

Milk electrically pasteurized in a manner no different from that employed for sale as liquid milk appears to be suitable for the production of acidophilus milk. The bacterial content of the original milk was reduced to a negligible quantity. This method of preparing cultured milk has several distinct advantages: (1) ease with which the milk can be prepared for inoculation; (2) whole milk can be used; (3) no special sterilizing equipment is necessary; (4) a product with a fresh sour taste and not a cooked taste or color is produced. Review of literature and references are given.

PATENT DIGEST

Baking and Milling

Baked Dough Mass Toasted Internally by Pointed Heating Element — Bruce Nelson Pulver, Akron, Ohio, to All-in-One Corp. of America. No. 1,802,532. April 28, 1931.

Cakes Iced in Inverted Position to Regulate Amount of Icing Put On—Oscar E. Segrin, Springfield, Mass., to Merrow Brothers, Inc., Boston, Mass. No. 1,802,842. April 28, 1931.

Multiple Baking Pans — Edward Katzinger to Edward Katzinger Company, Chicago, Ill. No. 1,789,981. Jan. 27, 1931.

Bread-Slicing Machine — Otto F. Rohwedder to Mac-Roh Sales & Manufacturing Company, Davenport, Iowa. No. 1,790,022. Jan. 27, 1931.

Cracker Pan of Frame and Wire Screen Construction—Joseph George Jackson to Edward Katzinger Company, Chicago, Ill. Nos. 1,790,270 and 1,790,504. Jan. 27, 1931.

Screw-Conveyor Type Mixer Produces Dough in Continuous Operation—Wilford Judson Hawkins Claiborne, Md. to American Machine & Foundry Company, Brooklyn, N. Y. No. 1,790,347. Jan. 27, 1931.

Automatic Weighing Machine for Dry Ingredients—William E. Cooper, Mendham, N. J., and Francisco A. Quiroz, Brooklyn, N. Y., to American Machine & Foundry Company, Brooklyn, N. Y. No. 1,790,366. Jan. 27, 1931.

Mechanized Rolling of Dough; Continuous in Operation—Daniel C. McCarthy, Chicago, Ill. No. 1,790,589. Jan. 27, 1931.

A Baking Oven With Traveling Hearth and Overhead Heating Tubes—William L. Mueller, La Grange, Ill., to Peterson Oven Company, Chicago, Ill. No. 1,790,876. Feb. 3, 1931.

Biscuits, Cakes, and the Like Stacked or Assembled Mechanically by Rotating Prisms—Marinus Marius Den Boer to Naamlooze Vennootschap, Bakovenbouw, V.H.H.P. den Boer, Dordrecht, Netherlands. No. 1,791,399. Feb. 3, 1931.

Beverages

A Heat-Insulated Box Type of Refrigerator for Beverage Dispensers—John C. Staton, to Coca-Cola Co., Atlanta, Ga. No. 1,797,451. March 17, 1931.

Tea Bags With Tagging Device That Prevents Entangling of Tag Cords—Howard H. D. Cooper to S. A. Schonbrunn & Co., Inc., New York City. No. 1,799,006. March 31, 1931.

Preparation of Hop Extracts for Cereal Beverages—Emil C. Horst, San Francisco, Calif. No. 1,800,632. April 14, 1931.

De-alcoholizing Fermented Beverage Without Removing Aromatic Constituents—Herman Heuser, Chicago, Ill. No. 1,800,940. April 14, 1931.

Canning and Glass Packing

Cans Cleansed Externally as Well as Internally—William Howard Rennie, Vancouver, British Columbia, Canada. No. 1,791,603. Feb. 10, 1931.

A Can Opener With a Rotary Feed Wheel and a Rotary Cutting Wheel — Gunnar Ahlquist, Minneapolis, Minn. No. 1,793,040. Feb. 17, 1931.

A Seal for Jars With a Closure Constructed to Entrap and Hold Sediment Apart From Contents of Jar—Leo A. Brigel, Cheviot, Ohio. No. 1,793,048. Feb. 17, 1931.

Machine to Form Can Bodies—Thomas J. Dugan, Lakewood, Ohio. No. 1,793,164. Feb. 17, 1931.

Cooker and Mixer for Canning Corn—Ogden S. Sells to Sprague-Sells Corporation, Hoopeston, Ill. No. 1,790,115. Jan. 27, 1931.

Adjustable Can Opener Makes Angular Opening in Can—Myro Patermann, Zehlendorf, Germany. No. 1,790,439. Jan. 27, 1931.

Can-Casing Machine—Leon Titus, Port Arthur, Texas, to the Texas Company, New York, N. Y. No. 1,791,174. Feb. 3, 1931.

Confectionery

Stick Candy Twisted by Disks Rotating in a Horizontal Plane — Fred E. Zaiss, Beverly Hills, Calif. No. 1,792,672. Feb. 17, 1931.

Shell Molds for Making Chocolate-Covered Cherries—Morris Strop, Woodmere, N. Y. No. 1,793,263. Feb. 17, 1931.

Pop Corn Ball Confections Formed and Packed by Plunger Type of Machine—William H. Carson, Norman, Okla. No. 1,796,321. March 17, 1931.

Fondant, Cream, and Such Confection Products Distributed to Desired Factory Stations by Inclosed Screw Conveyors—William F. Heller, Richmond Hill, N. Y., to Loft, Inc., Long Island City, N. Y. No. 1,796,928. March 17, 1931.

Continuous Process for Preparation of Fondant for Candy Centers — Peter C. Laureys, Jersey City, N. J., to Loft, Inc., Long Island City, N. Y. No. 1,796,934. March 17, 1931.

Dairy and Egg Products

Dual Milk Pasteurizing-Holding Units With Plural Elongated Containers—Charles E. North, Montclair, N. J., to The Creamery Package Manufacturing Co., Chicago, Ill. No. 1,791,511. Feb. 10, 1931.

Spray Method of Making Ice Cream in a Continuous Manner—Clarence W. Vogt to Vogt Instant Freezers, Inc., Louisville, Ky. Nos. 1,791,772, 1,791,773, and 1,791,774. Feb. 10, 1931.

A Clamp-Lever Lid Fastener for Egg Crates With End Cleats—Ira O. Frye, Beacon, Iowa. No. 1,793,078. Feb. 17, 1931.

Copies of Patents

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Photostatic copies of foreign patents may be obtained at the same address, prices being forwarded on application.

Copies of patents should be ordered by number, as titles used in this digest seldom correspond with title of patent.

Compressed Pulp Protectors Insulate Bottles of Milk—Amos L. Foreman, Chicago, Ill. No. 1,790,299. Jan. 27, 1931.

Horizontal Ice Cream Freezer With Spaced Concentric Cylinders and Spiral and Radial Stirrers—James R. Green, Everett, Wash. No. 1,790,373. Jan. 27, 1931.

A Sanitary Rotary Milk Pump—James P. Hansen to Tri-Clover Machine Company, Kenosha, Wis. No. 1,790,470. Jan. 27, 1931.

Butter Made by Subjecting Stream of Cream to Repeated Impacts—Edgar Perks, Auckland, New Zealand. No. 1,791,000. Feb. 3, 1931.

Production of Plastic Cream Containing Not Less Than 65 Per Cent Butter Fat—Herman D. Wendt to the Sharples Separator Company, West Chester, Pa. No. 1,791,068. Feb. 3, 1931.

Making Butter From Plastic Cream Containing Not Less Than 65 Per Cent Butter Fat—Herman D. Wendt to the Sharples Separator Company, West Chester, Pa. No. 1,791,069. Feb. 3, 1931.

Fruits and Vegetables

Open-end Scoop With Removable Tines for Picking Cranberries—George H. Chandler, Marshfield, Mass. No. 1,793,464. Feb. 24, 1931.

Concentration of Grape Juice to Prevent Fermentation During Storing and Shipping—Paul Garrett, New Rochelle, N. Y. No. 1,790,140. Jan. 27, 1931.

Machine for Removing Ends From String Beans—Jacob L. Fuhremann, Berlin, Wis. No. 1,794,009. Feb. 24, 1931.

Fresh Fruit Treated With Alkaline Solution to Prevent Blue-Mold Decay—Ernest M. Brogden, Santa Monica, Calif., and Miles L. Trowbridge, Palms, Calif., to Brogdex Co., Winter Haven, Fla. No. 1,794,346, Feb. 24, 1931; and No. 1,795,275. March 3, 1931.

Wire Fastener for Fruit and Vegetable Containers—Charles L. Brademeyer and Claude L. Koonce, Coleman, Fla. No. 1,790,087. Jan. 27, 1931.

Meat Packing

Mechanized Poultry Plucking—Morris D. Reiss, New York City. No. 1,791,843. Feb. 10, 1931.

Ham Press With Container Having Removable Closures at Both Ends—Clarence Butz, Muscatine, Iowa. No. 1,792,411. Feb. 10, 1931.

Hard Wood Distilled at 160-900 deg. F. to Prepare a Meat Cure—Ernest H. Wright, Kansas City, Mo. No. 1,792,561. Feb. 17, 1931.

General Processes and Products

Nut Cracking Machine Equipped to Separate Kernels From Shells—Aron F. Walker, Exeter, Mo. No. 1,802,294. April 21, 1931.

Compressed Yeast Mixed With 10 Per Cent Starch and Fried in Deep Fat—Herbert C. Gore, Scarsdale, N. Y., and Charles N. Frey, New York City, to Standard Brands Inc., Dover, Del. No. 1,802,645. April 28, 1931.

Fat Emulsions Cooled by Means of a Revolving Cooling Drum—Wilhelm Gotthilf Schroeder, Lubeck, Germany. No. 1,803,212. April 28, 1931.

Hydrocyanic Fumigation — Harry W. Houghton Glen Echo, Md., to Safety Fumigant Company, Boston, Mass. No. 1,790,095. Jan. 27, 1931.

Continuous Production of Alimentary Paste Products—Giovanni Crespi, Milan, Italy. No. 1,790,368. Jan. 27, 1931.

Mechanized Separation of Walnuts From Hulls—Albert W. La Forge, Chino, Calif. No. 1,791,362. Feb. 3, 1931.

Ethylene Oxide Insecticide and Fumigant—Ruric C. Roark and Richard T. Cotton, Washington, D. C., to the government and the people of the U. S. A. No. 1,791,429. Feb. 3, 1931.

Zinc Sulphate and Lime Fungicide and Bactericide—John W. Roberts, Washington, D. C. No. 1,791,430. Feb. 3, 1931.

Peanuts Removed From Vines and Cleaned Mechanically — Paul L. Morris, Pottstown, Pa. No. 1,791,454. Feb. 3, 1931.

Sugar and Molasses

Radial Extraction of Honey by Centrifugal Machine With Rotating Strainer—Huber H. Root to The A. I. Root Company, Medina, Ohio. No. 1,791,605. Feb. 10, 1931.

A Scraper Plate With Toothed Edge for Cleaning Shredding Roll of Cane Crusher—Francis Maxwell, Wallington, England. No. 1,792,502. Feb. 17, 1931.

Sugar-Beet Harvesting Machine—Louis F. Bollmeier and Richard P. Colwill, Omaha, Neb. No. 1,792,529. Feb. 17, 1931.

Stove for Boiling Syrup—Velico H. Minchevly, Clinton, Iowa. No. 1,795,789. March 10, 1931.

General Equipment

Liquid-Level Indicator—Clarence A. De Giers, New York City, to The Liquidometer Corporation, Wilmington, Del. No. 1,791,489. Feb. 10, 1931.

Smoke Abater and Soot Remover—Emil R. Kuntzsch, St. Louis, Mo. No. 1,791,506. Feb. 10, 1931.

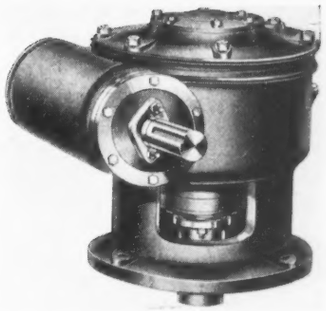
• **Driving Mechanism for Slicing Machines With a Rotating Knife**—Cornelis Franciscus Maria van Berkel, Wassenaar, Netherlands, to U. S. Slicing Machine Co., La Porte, Ind. No. 1,791,768. Feb. 10, 1931.

Water-Level Indicator for Boilers—John J. Cain, Bayonne, N. J. No. 1,791,120. Feb. 3, 1931.

Vertical Batch Mixer With Central Screw Agitator — August Schuchardt, Winona, Minn. No. 1,791,169. Feb. 3, 1931.

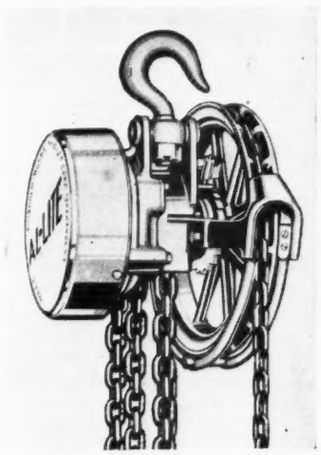
Package Wrapping Machine—Elmer L. Smith, Longmeadow, Mass., and Frederic B. Fuller, Springfield, Mass., to Package Machinery Company, Springfield, Mass. No. 1,791,171. Feb. 3, 1931.

NEW EQUIPMENT FOR FOOD MANUFACTURERS



Aluminum Chain Hoist

DESIGNED to combine lightness and ease of handling with strength, the chain hoist recently announced by the Chisholm-Moore Hoist Corp., Tonawanda, N. Y., is made from a corrosion-

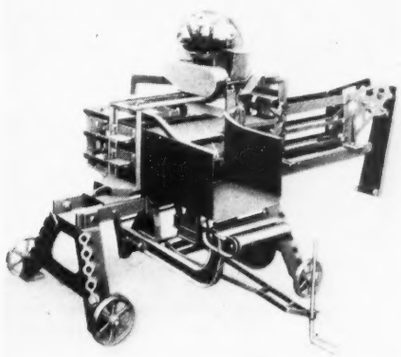


resisting aluminum alloy. This hoist is claimed to be one-third lighter and to contain fewer parts than other type hoists, without sacrifice in performance. It has Alemite lubrication, hardened and ground ball bearings, planetary type gears, dustproof housing, and adjustable brake.

New Casing and Sealing Machines for Canners

TWO additions have recently been added to the line of packaging machinery manufactured by the Burt Machine Co., Baltimore, Md. The automatic gumming and sealing machine for fiber shipping containers is designed for general use but has features that recommend it especially to the canning industry. It seals on one side only as the filled container passes through the machine. Adjustable to the size of the carton, it can be used in conjunction with a labeling or casing machine. The carton can be sealed on bottom side, stored for shipment, and then sealed on top after the contents have been inspected and labeled for shipment.

Discharging two layers of cans into the case at each forward stroke of its plunger, the Burt casing machine is suitable for canners producing more than 400 cases of 24 cans each per hour. Complete filling of the case without



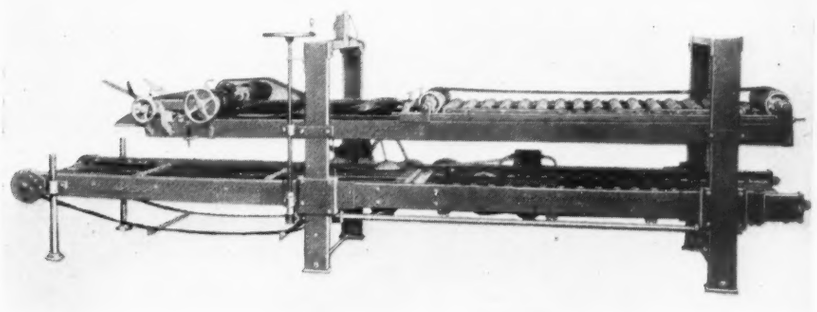
making use of a can-dividing mechanism and a double-track magazine leading into the shelves can be accomplished by a slight trip of the operating clutch.

New Vertical Speed Reducer

FOOD contamination by lubricating oil has always been a source of worry to manufacturers of high-quality food products. Elimination of oil leakage, as claimed for the speed reducer recently announced by the Foote Bros. Gear & Machine Co., 111 North Canal St., Chicago, Ill., should recommend it to those food manufacturers who find speed reducers a necessary part of their processing machinery. This reducer is of the vertical worm type and is obtainable at a price slightly higher than the usual type that is not claimed to be oil-leak-proof.

The leak-proof feature is obtained by pressing the bronze worm gear ring on a hollow steel center, where it is held rigid by two flat ball thrust bearings. This arrangement is mounted on bronze bearings and the hollow center is fastened to the vertical shaft at the top of the reducer to form a cavity below which extends nearly four-fifths of the length of the shaft. In this cavity a sealed tube is fastened to the lower part of the reducer and extends upward to a point above the oil level. The open top of the tube is covered by the hollow steel center previously mentioned.

This construction forms two chambers, one in which the worm gear operates and one in which the vertical shaft rotates free from contact with oil at all points. This leak-proof feature can be supplied in all sizes of the IXL vertical-type reducers manufactured by this company.

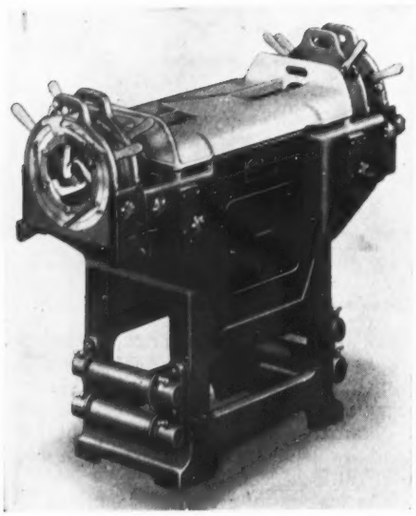


Fancy Whole-Kernel Corn Cut by Machine

MECHANIZED cutting for fancy whole-kernel pack from field-run corn of the Bantam, Crosby, and Country Gentleman varieties is said to be an accomplishment of the 1930 season. During this season field-run corn had an unusually high percentage of nubbins and ears of small size. However, a large canner reports that he packed 155,294 cases of fancy whole-kernel corn, every ear of which was cut on the Tuc cutter of the United Co., Baltimore, Md.

This machine is adaptable for cutting both the whole-kernel and the cream-style corn and has a capacity of more than a ton of corn per hour. The cutting parts are visible and readily accessible for cleaning purposes even while the machine is in motion. The cutting heads are interchangeable and may be quickly replaced by sharpened or adjusted units without holding up production. It has direct drive only, requires less than ½-hp. motor, does not exceed 4x1½x3-ft. dimensions, and weighs 700 lb.

The cutter directly supports the conveyors for the cut corn and cobs and may be used in conjunction with the



Tuc husker equipped with an electrical counter. This relationship can result in workers being put on an accurately recorded piece-rate basis. The accompanying illustration shows the cutter and its construction which permits feeding with both hands.

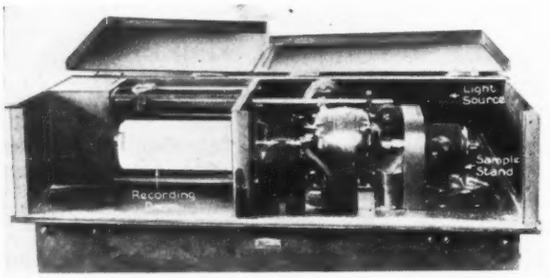
Colors Analyzed and Recorded Automatically

MORE accurate duplication of characteristic colors in food products is encouraged by the recording color analyzer developed and marketed by the General Electric Co., Schenectady, N. Y. This analyzer is a photo-electric mechanism that automatically draws the color curve of a sample in the visible spectrum. This curve forms a permanent record to be used as a standard or as a guide for matching colors with a standard.

It is declared that the color of either solid or transparent substances can be analyzed, and that the analyzer can be used to control the basic materials entering into the manufacture of colored products. Approximately 3½ min. is required to obtain a characteristic curve.

The power source includes a 110-volt, 60-cycle alternating current to supply the power transformer and the flicker motor and an 8-volt direct current for the lamp and filament currents. An 8-volt, 210-ampere-hour storage battery can be used for the latter.

Color matching plays an important part in several of the food industries, such as beverages, confectionery, baking, and fruit processing.

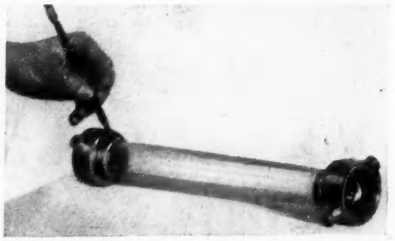


Recording Color Analyzer

Glass Soldered to Metals

THE accompanying illustration shows a soldered union of glass tubing with metal sanitary pipe fittings. This joint is made possible by a method of soldering developed by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., in which the glass surface is given a metallic glaze before solder is applied to unite the glass and metal units.

In the food industries this development will find application in fitting measuring, holding, and processing



tanks with calibrated panels and with windows. It also permits joining of metal bushings to the lining of glass-lined tanks.

MANUFACTURERS' PUBLICATIONS

Controller Equipment—A section of Catalog 4000, devoted to accessories of air operated controller equipment, has been prepared by the Bristol Company, Waterbury, Conn.

Power Generation—Fuel burning and steam generating equipment manufactured by the Combustion Engineering Corporation, New York City, is described and illustrated in a general condensed catalog known as GC-6.

Bottle Washers—Different types of bottle washers manufactured by the Union Engineering Company, Cleveland, Ohio, are described and illustrated in descriptive bulletin.

Conveyors—Roller conveyors, incline elevators, freight lift elevators, roller spirals, and other types of industrial conveyors are illustrated and described in a 16-page booklet published by the Standard Conveyor Company, 315 Second Ave., N.W., North St. Paul, Minn.

Small Power Motors—In catalog C-1883, Westinghouse Electric & Manufacturing Company, West Springfield, Mass., describes and illustrates by halftones and diagrammatic drawings, its various types of small motors and their repair parts.

Power Transmission—Link-Belt Company, 300 W. Pershing Road, Chicago, Ill., illustrates its various types of materials handling equipment in catalog folder No. 1223.

Roller Chains—The advantages of roller drive chains are set forth in an illustrated leaflet prepared by the Diamond Chain & Mfg. Company, Indianapolis, Ind.

Water Stills—Equipment for the production of pure distilled water is descriptively cataloged in a 28-page illustrated booklet prepared by the Atlas Copper & Brass Mfg. Company, 2724 High St., Chicago, Ill.

Milk Condensing and Drying Equipment—In an illustrated leaflet the C. E. Rogers Company, 8731 Wood St., Detroit, Mich., announces its spray-process milk-powder plant.

Ice Cream Freezers—The York Ice Machinery Corporation, York, Pa., in a 20-page booklet known as bulletin 30154, illustrates and describes the installations of its ammonia ice cream freezers with York ammonia float control.

Ice Cream Filling Machines—Lily-Tulip ice cream filling machine for 5 and 10 cent cups, is illustrated in a descriptive leaflet prepared by Lily-Tulip Cup Corporation, 122 East 42d St., New York, N. Y.

Water Regulators—Campbell feed water regulators for steam boilers and their operations are described and illustrated by halftones and diagrammatic drawings in a 14-page booklet published by the Atlas Valve Company, Newark, N. J.

Magnetic Separator Pulleys—In an illustrated leaflet, Cutler-Hammer, Inc., 12th and St. Paul Aves., Milwaukee, Wis., describes its magnetic separator pulley whose coil shield is made of Allegheny metal.

Air Ejectors for Vacuum Processes—Steam jet air ejectors for vacuum processes manufactured by the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., are described in an illustrated leaflet.

Two-Car Elevators—An elevator with two cars operated separately in the same shaftway is described in construction and operation by an illustrated release made by the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

Induction Motors—Totally inclosed fan-cooled induction motors for Class 1, Group B, hazardous locations and of Class 2 construction, are described and illustrated in a loose-leaf catalog folder published by General Electric Company, Schenectady, N. Y.

Food Dicing Machine—In an illustrated leaflet, the American Utensil Company, 10 South La Salle St., Chicago, Ill., announces its large-capacity new American dicer.

Non-aerating Extractor and Pre-Cooker—Method and equipment for extracting and pre-cooking tomato juice under non-aerating conditions is the subject matter of an illustrated leaflet published by the American Utensil Company, 10 South La Salle St., Chicago, Ill.

Glass Lining—This is an equipment and service magazine for the dairy and other food industries, published by The Pfaudler Company, Rochester, N. Y.

Switches and Controllers—Inserts for loose-leaf catalogs, prepared by General Electric Company, Schenectady, N. Y., describe and illustrate magnetic switches for induction motors manually operated field switches, thermostats with control limits ranging from 20 to 212 deg. F., and automatic full-voltage controllers for synchronous motors.

Tubular Separators—In an illustrated folder the Sharples Separator Company, West Chester, Pa., describes its factory-size tubular separator for the production of better quality cream.

Dairy Washing and Sterilizing Machine—Hauk, 205 South 16th St., Milwaukee, Wis., has prepared an illustrated leaflet announcing its heavy-duty washing machinery equipped with a wash tank, 180 deg. F. rinse tank, and a high-pressure retort.

Milk Evaporator—In bulletin 257, the Buffalo Foundry & Machine Company, 1635 Fillmore Ave., Buffalo, N. Y., illustrates and gives specifications and operation data regarding its Buflovac milk evaporators.

Dairy Power Plants—The new Alpha vertical dairy power plants manufactured by the DeLaval Separator Company, 165 Broadway, New York City, is described in detail in an eight-page illustrated booklet.

Cerelose—In an illustrated leaflet folder Corn Products Refining Company, 17 Battery Place, New York City, defines cerelose and suggests some of its uses.

Electrical Equipment—In a 1352-page catalog for 1931-1932, Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., gives descriptions and illustrations of equipment representative of the many products manufactured and sold by this company.

Fresh Meat Cutters—Band-saw types of meat cutters are illustrated and commented on in a booklet prepared by the Vaughan Company, 730-740 North Franklin St., Chicago, Ill.

NEWS OF THE MONTH

Supreme Court Tax Decision Blow to Chain Stores

By O. Fred Rost
Director of Distribution Surveys
McGraw-Hill Publishing Co.

DECISION of the U. S. Supreme Court upholding Indiana's chain-store tax law is expected to have far-reaching consequences, eventually resulting in important changes in many industries and in the distribution of consumer goods. The statute now upheld provides that it shall be unlawful "to establish or operate any store within the state without first obtaining a license, which must be renewed annually."

The annual license fees are $3 for one store, $10 each for the second to fifth store, $15 each for the sixth to tenth store, $20 each for the tenth to twentieth, and $25 each for every store above twenty operated "under the same general management, supervision, or ownership."

Legislators in many states confronted with the need for tapping new sources of revenue have been urged by independent tradesmen, local protective organizations, and political interests to put taxes on chains, and they looked for the present decision to provide guidance in framing chain tax legislation.

The case was taken to the Supreme Court by the Indiana State Board of Tax Commissioners after a specially constituted district court enjoined the Indiana Tax Commissioner from enforcing the provision of its 1929 chain-store tax law and collecting from Lafayette A. Jackson, owner of 225 grocery stores, a total of $5,443 in license taxes. That District Court held the law to be "offensive to the federal and to the state constitution" in that it failed to fulfill the constitutional requirements that "law-making bodies shall apply the same means and methods to all persons of the same class."

In reversing this decision, the U. S. Supreme Court cites some of the outstanding advantages possible under chain-store operation. It is significant that it practically eliminates the future possibility of having voluntary chains subjected to chain taxes in that it clearly sets forth that "it need only be remarked that these are voluntary groups, and that series of independent units cannot, in the nature of things, be as efficiently and successfully integrated as a chain under a single ownership and management."

Admitting that individually owned department stores, taxed but $3 annually under the disputed law, employ methods of chain stores, and reap many advantages, the decision stipulates the extremely important and fundamental difference that "whereas a department store spreads its efforts over a number of different sorts of shops under one roof, the chain-store owner concentrates its energy upon but one kind of stores located in many neighborhoods," and that "obviously greater specialization in management is possible in the latter type of enterprise than in the former."

Although the decision to uphold the Indiana tax law is final, representing the opinion of five justices, including Chief Justice Hughes, a dissenting opinion was submitted by the four remaining justices. The act is "a clear and hostile discrimination" and "the Legislature has misapplied its power to classify, with the result of reaching an end forbidden by the fourteenth amendment," according to the dissenting opinion.

Immediate effects of the decision may become evident in several quarters. Of 44 state legislatures meeting this year less than one-third have adjourned. Among those still in session are many that now have chain taxing measures under consideration. Many of those measures were patterned after the Indiana law or that of Mississippi or North Carolina, the latter two now before the U. S. Supreme Court awaiting decision. It is likely that legislatures in states where public sentiment strongly favors chain taxes will revise pending measures to conform to the now sustained Indiana law.

Chain operators take the matter more or less philosophically. Taxes have always been considered a part of the legitimate operating expense of any business. As such they were added to the cost of the goods and became part of the final retail price paid by the consumer. Any new tax burdens imposed by any state must necessarily increase the consumer's cost of merchandise sold by the chain stores, within that state. Thus any burdensome taxes probably will raise the general price level but slightly, and may somewhat reduce any existing gap between prices quoted by the chains and those by independent retailers, without, however, disturbing the underlying economic causes for the recent expansion of chain-store selling.

Since late 1929 most of the important chain systems have been engaged in a program to eliminate unprofitable units, to concentrate greater effort upon increasing the efficiency of existing units, to limit new expansion to localities where conditions will insure profitable operation. Prohibitive taxation will simply serve to encourage that program.

However, there is much speculation as to how far-reaching the present decision may eventually prove. The term "store," as used in the Indiana act, "shall be construed to mean and include any store or stores which are owned, operated, maintained, or controlled by the same person, firm, etc., in which goods, wares, or merchandise of any kind are sold either at retail or wholesale."

This clearly includes all groups of chain stores or retail establishments. It obviously would include gasoline service stations, newsstands at railroad stations, bus terminals, and hotels. There is some speculation as to whether or not owners of milk routes, gasoline and oil routes, or of wagon routes selling groceries, when operating more than one vehicle, will be classified as chains.

Food Business Decline Continues

Early May witnessed a slight increase in the index of *The Business Week,* which indicates some improvement in general business activity. This index still stands at approximately 80 per cent of normal. Coinciding with this, employment for April shows, according to the U. S. Department of Labor, a 0.2 per cent increase over March. Payrolls, however, decreased 1.5 per cent in the same period, indicating a decrease in the funds available for the purchase of consumer goods; and wholesale commodity prices went to 73.3, a fall of 1.2 below the March figure.

In the food field, prices continued the decline shown over the last few months. Wholesale food prices fell to a level of 75.6, compared to 76.7 for March and 94.6 for April, 1930. On April 15, retail food prices were about 2 per cent below March 15 and 18 per cent below April 15, 1930. Employment in the food industries fell 0.9 per cent during April and payrolls were off approximately 1 per cent.

Show Food Equipment at Chemical Exposition

FORTY-THREE exhibitors at the Thirteenth Exposition of Chemical Industries, held in Grand Central Palace, New York City, May 4-9, made a direct bid for the food man's attention; however, 187 of the 277 industrial exhibitors sought business in the food field.

Increased interest in research and plant control work in both the food and non-food industries was strongly suggested by the fact that 20 per cent of the exhibitors are engaged in manufacture and distribution of research units and laboratory apparatus and supplies.

Despite adverse business conditions and gloomy predictions for the near future, statistics show this exposition to have been the largest from the standpoint of total number of exhibitors and visitors; 103,000 visitors, including students, viewed the showings of 311 industrial and non-industrial exhibitors.

Food packaging came in for most of the truly new developments that were in evidence. The products previously known to the equipment field but shown for the first time by the particular exhibitor or emphasized at chemical exposition as being of interest to food industrials included improved types of dryers, mixers, acid-resisting equipment, and fittings constructed wholly or in part of glass, tile, quartz, rubber, alloys, and resin-like materials, filling and labeling machines, labor-aiding mechanisms for handling materials, air-conditioning equipment, heat exchangers and control instruments.

Detailed discussion of the new equipment shown at the exposition will appear from time to time in the department of FOOD INDUSTRIES devoted to new equipment.

Cereal Chemists Consider Flour Problems of Baker

THE seventeenth annual convention of the American Association of Cereal Chemists was held at the Brown Hotel, Louisville, Ky., May 18 to 21. A highly enlightening program presented to the 170 members in attendance justified the nation-wide publicity given the convention by three broadcasts over the National Broadcasting Co. radio network, calling attention to the rigid control and guidance exercised during the milling of flours.

Departing from the previous practice of confining the convention activities to cereal chemists, a half-day session was given over to a joint session with the American Society of Bakery Engineers, and many papers were presented from the viewpoint of commercial bakers, as well as of technical research investigators.

The bulk of the program was devoted to familiarizing the mill chemist with the problems and results of studies important to the producers of cereals and cereal products, especially wheat flour, to the bread and pastry bakers, and to the research workers.

R. K. Durham,
New president of the American Association of Cereal Chemists

In a joint meeting with the Louisville section of the American Chemical Society, H. R. Kraybill, Purdue University, reported studies on the relation of plant nutrition to composition of wheat. In a paper entitled "New Fumigants for Destroying Insect Pests in Foodstuffs," R. C. Roark, Bureau of Chemistry and Soils, Washington, D. C., called the convention's attention to recently developed fumigants. Ethyl formate has been used more widely with dried fruits, but it has been found effective in destroying weevils in wheat. Ethylene dichloride, commercially used for destroying household moths, when mixed with carbon tetrachloride to reduce fire hazard, finds successful application in the cereal industry and with other non-fatty foodstuffs. Ethylene oxide was reported as being the most effective of the new fumigants. It may be used alone or in combination with gaseous or solid CO_2.

A study of factors influencing heat of hydration of bio-colloids, such as wheat flour and starch of wheat, rice, and potato, reported by W. F. Geddes, University of Manitoba, Winnipeg, Canada, gave an insight into the cause of heat development when water is mixed with wheat flour or starch. This study showed that hydration of starches is not an external surface effect alone, but that the starch granule is permeated, and that the heat of hydration is influenced by the vegetable and cereal source of the starch.

Addition of flour made from wheat sprouted under controlled conditions permits the baker to produce a desirable loaf of bread from low diastatic flour, according to the paper prepared by M. C. Markley and C. H. Bailey, University of Minnesota.

Nearly fifty papers covering practices, processes, products, and technical studies were read before the convention, and visits were made to industrial plants during the four days of the session.

Officers of the association elected at the meeting are as follows: President, R. K. Durham, Rodney Milling Co., Kansas City, Mo.; vice-president, L. D. Whiting, Ballard & Ballard Co., Louisville, Ky.; secretary-treasurer, M. D. Mize, Omaha Grain Exchange, Omaha, Neb.; editor-in-chief, *Cereal Chemistry*, D. A. Coleman, Bureau of Agricultural Economics, U. S. Department of Agriculture, Washington, D. C.; managing editor, C. C. Fifield, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

Large Gain Is Reported In Tomato-Juice Sales

THE 1930 pack of tomato juice in tin amounted to the equivalent of 868,908 cases of 48 No. 1's (Eastern). The pack in glass during the same year totaled 247,935 cases on the basis of 48 4-oz containers. Eighty-two per cent of the above figures were reported directly to the Department of Commerce by individual manufacturers. The remaining 18 per cent was based on estimates of the packs of non-reporting manufacturers made by state canners' associations.

The 1930 production of tomato cocktails was put up practically entirely in glass, the glass pack having amounted to an equivalent of 470,056 cases of 48 4-oz. containers, as compared with the output in tin of 1,843 cases of 6 No. 10's.

Questionnaires upon which these figures are based were mailed to 60 firms reported to be manufacturing these products. It is believed that the survey covers practically the entire 1930 production of tomato juice and cocktails.

Firms representing slightly better than 80 per cent of the 1930 production showed an increase in the pack of tomato juice in tin (on the basis of 48 No. 1's) from 97,854 cases in 1929 to 712,586 cases in 1930. The same manufacturers reported a pack of tomato juice in glass in 1929 of 56,550 cases (on the basis of 48 4-oz. bottles) and of 203,935 cases in 1930.

COMING EVENTS

JUNE

1-5—Association of Operative Millers, Kansas City, Mo.

2-5—National Confectioners' Association, Stevens Hotel, Chicago, Ill.

4-6—American Feed Manufacturers' Association, French Lick, Ind.

8-9—Certified Milk Producers Association of America, Adelphia Hotel, Philadelphia, Pa.

15-18—National Association of Cost Accountants, William Penn Hotel, Pittsburgh, Pa.

16—National Macaroni Manufacturers' Association, Edgewater Beach Hotel, Chicago, Ill.

22-27—National Association of Credit Men (Food Group), Hotel Statler, Boston, Mass.

25-26—National Live Stock and Meat Board, Chicago, Ill.

JULY

14-15—American Dairy Science Association, University of California Farm, Davis, Calif.

14-17—International Dairy Congress, Copenhagen, Denmark.

Refrigerating Engineers at Kansas City Discuss Food Freezing and Storage

QUALITY and variety in the papers presented, a representative attendance indicated by a registration of 160, and a 50-50 division between work and play made the eighteenth Western meeting of the American Society of Refrigerating Engineers a worth-while occasion. It was held at the Kansas City Athletic Club, Kansas City, Mo., on May 6, 7, and 8.

At the three morning sessions, fourteen papers were offered dealing principally with industrial applications of refrigeration, commercial-domestic machinery, and new thermal problems. Discussing refrigeration in air conditioning, Maurice Olchoff of the Natkin Engineering Co., Kansas City, summarized the results from recent studies regarding the heat losses from the human body and the effect of temperature, humidity, and air motion on human comfort. Tabulated data were given to show the relations between the heat loss from the human body by evaporation, radiation and convection, and the dry-bulb temperature; and the desirable indoor temperature corresponding to outside temperatures.

A number of observations made by A. W. Archer on refrigeration in the bakery pointed to the fact that, if all materials can be stored or held at the proper temperature and condition before the various ingredients are scaled into dough, a better bread will be obtained. Also, the lower load on the refrigerating plant made possible by conditioning the materials over a longer period of time and by using off-peak energy will reduce the manufacturing cost.

The choice of refrigerating system used depended on local circumstances, but many bakers favored direct-expansion, believing that it had fewer ills than a brine system. Shell and tube condensers conserved floor space and were more economical than the double-pipe condenser. Cooling towers reduced the water requirements. In storage and dough rooms requiring temperatures of 40 and 80 deg. F., respectively, the unit cooler with radiator, fan, and thermostatic control had proved effective. For cleanliness in the dough room the arrangement of overhead coils should be improved. An efficient Baudelot tank system for supplying cold water was described, and comment made on different methods of supplying cold air to the mixers and the fermentation room. Because of the complication and space requirements of cold-air equipment, many bakers preferred the simple humidifying unit and cooling coils.

With a view to stimulating thought on new uses for refrigeration, Hugh J. Krampe, of the Armstrong Cork Co., presented a symposium on the uses of low-temperature test rooms by manufacturers to duplicate the actual conditions met by the finished product. As an illustration, the American Can Co. has a low-temperature test room that may be run down to —50 deg. F. for testing out various rates of freezing fruit and vegetables.

The foundation of the value of chemistry is research, James C. Irwin, Jr., of the U. S. Cold Storage Co., Atlanta, Ga., pointed out. Considering the problems involved, the total of research on food freezing and storage had been small, he said. Government agencies had available a large amount of data, most of which were inconclusive in their application to storage.

E. M. Dodds, chairman of the convention

In the past few years an increasing number had attacked these problems, taking advantage of the assistance offered by pure science. The work of Ottesen, Birdseye, Taylor, Stuckey, and others had made popular the term "quick-freezing." The work of Sharp and associates resulting in conclusions as to the effect of carbon dioxide in egg storage is an excellent example of applying pure chemistry to a cold-storage problem. Stuckey's experience in freezing figs at temperatures of zero and above rather than at lower temperatures is another example of the detailed study required on each and every item. It is such studies, rather than trying to make one procedure a universal solution, that will spread the field of freezing and storage.

Packaging as Sales Aid Emphasized at Meeting

THE first packaging conference and exhibit held under the auspices of the American Management Association at the Hotel Pennsylvania in New York City, May 19-21, brought to light a great amount of information and interest in all phases of packaging problems. More than 2,000 individuals registered.

Both at the sessions of the packaging "clinic" and on the exhibition floor, the emphasis on sales appeal of the package was apparent. Although "eye-appeal" characteristics, such as color, modern printing, and visibility of the product, received their share of attention, the more practical requisites for continued sales, such as protective quality, ease of opening and reclosing, and general convenience during use, also were stressed. Problems arising when an older package is to be restyled and in preserving the identity of a family of products also were discussed.

A silver cup, to be known as the Irwin D. Wolf trophy, will be awarded by the American Management Association for the best package developed and put on the market during 1931, according to an announcement made by W. J. Donald, managing director of the association, at a luncheon given in connection with the conference.

California Food Sales Are 20 Per Cent, Census Shows

WITH release by the U. S. Census Bureau on May 24 of the preliminary report on retail trade in California, the first complete state-wide figures are available. Sales of food are revealed as less than sales of automotive equipment and supplies, food representing 20.29 per cent, against 23.56 per cent for the automotive group.

The claim that this upset of general opinion is shown because the climate induced more people to raise some of the food they consume is met by the fact that the figures do not show the proportionately heavier percentage in food sales within cities, where little or no food can be raised. In the three largest cities, San Francisco, Los Angeles, and Oakland, sales of food averaged lowest in the state, accounting for but 17.32 per cent of total; other cities in the San Francisco area averaged 28.28 per cent. At Berkeley, food sales rose to 30.93 per cent; Alameda, 39.16 per cent; and at Southgate, a city with 19,632 population, about ten miles from Los Angeles, food sales represented 48 per cent of all retail sales.

A population of 5,677,251 in the state during 1929 bought goods to the amount of $3,268,545,636 at retail. The cities bought $2,556,371,792, or 78.2 per cent, although their 3,571,610 population represents but 62.9 per cent of the state total. Sales per capita averaged $575.73 for the state, representing an average of $715.74 in the 47 large cities, and only $338.22 in smaller towns and the remaining territories.

General merchandise and department stores show the highest average sales, $160,568 for each of the 2,630 in the group, while 24,063 retail food stores had the lowest average, $27,566 annual sales.

Detailed figures of sales in the food group show that 10,793 grocery stores of all types averaged $23,068 each in annual sales.

Announce Official Canning Standards for Apricots, Cherries, and Tomatoes

FOLLOWING the conferences with canners in Washington and San Francisco, at which a number of objections to the tentative standards came to light, Secretary of Agriculture Hyde has officially promulgated revised specifications to be required of all canned tomatoes, apricots, and cherries which do not bear the sub-standard label.

The order will become effective 90 days from signature, or on July 27, 1931. The new standards are as follows:

Canned Tomatoes

STANDARD

Canned tomatoes are the normally flavored and normally colored canned food consisting of the peeled, cored and trimmed, whole or large pieces of the mature red fruit of the tomato vine (*Lycopersicum esculentum*), with or without the drained juice of peeled, cored and trimmed tomatoes in amount not exceeding that normal to the fruit being packed, and with or without added seasoning (sugar, salt).

MEANING OF TERMS

The fruit shall be considered as whole or in large pieces when at least 45 per cent of the total contents will be retained after draining for two minutes on a sieve* having two meshes to the inch. On containers of less than 3 lb. net weight sieves 8 in. in diameter are used. On containers of 3 lb. net weight or more sieves 12 in. in diameter are used.

The fruit shall be considered normally colored when a sample at least 1 in. deep of the homogeneous pulped meats shows a red color containing at least 58 per cent red and not more than 37.3 per cent green, in terms of the three primary color distribution curves of the Optical Society of America, referred to Abbott-Priest standard white light.† In performing this test the material retained on the 2-mesh sieve is pulped and freed from air bubbles. It is then placed in a black container and visible seeds are removed by skimming or pressing below the surface.

The fruit shall be considered as peeled when there are not more than 1.5 sq.in. of peel per pound of net contents.

The fruit shall be considered as trimmed when the total exposed area of unsightly blemishes, such as scars or brown or black colored portions, does not exceed ¼ sq.in. per lb. of net contents.

EXCEPTIONS

Canned tomatoes which fail to meet the above standard only in that they contain added pulped and strained tomato material need not bear the low-quality legend if labeled "tomatoes with puree from trimmings."

Canned Cherries

STANDARD

Canned cherries are the normally flavored and normally colored canned food consisting of (1) the normal- and uniform-sized, fleshy, mature, unblemished, stemmed, whole fruit of the cherry tree and (2) sugar solution.

The weight of fruit in the container is not less than three-fifths the weight of water which the sealed container will hold at 68 deg. F., except that when necessary to prevent crushing of the fruit a tolerance not exceeding the combined weight of three average units is allowed. The liquid portion of the finished product reads not less than 16 deg. Brix (read at the proper temperature for the instrument used).

MEANING OF TERMS

The fruit shall be considered normally colored if the general color of the flesh be yellowish white. Units of 0.1 oz. or larger are considered of normal size. The cherries shall be considered uniform in size if 80 per cent of the units will pass through a circular opening 25 per cent larger in diameter than that through which the smallest unit will pass. The fruit shall be considered fleshy if the skin and flesh of the drained cherries is 88 per cent or more of their total weight.

The fruit shall be considered unblemished if 80 per cent or more of the units in the container are free from scabs, excessive healed cracks, or other unsightly blemishes. Cracks are considered excessive when their total combined length and width exceeds ½ in. excluding checks less than ⅛ in. wide located in the stem depression and concentric with its sides. Unhealed cracks which form during cooking are not considered blemishes.

The weight of the fruit in the container is that of the fruit material in both the solid and liquid components and is thus equivalent to the "put-in weight."

EXCEPTIONS

Canned cherries which fail to meet the above standard only in that they consist of cherries packed in water need not bear the low-quality legend if labeled "water-pack cherries."

Canned cherries which fail to meet the above standard only in that they consist of pitted whole cherries need not bear the low-quality legend if labeled "pitted cherries," even though the units may fail to meet the requirements for normal size and uniformity of size.

Canned cherries which fail to meet the above standard only in that the flesh is of some color other than yellowish white, as red sour cherries, Bing cherries, black cherries, etc., need not bear the low-quality legend if labeled to show the type to which they belong.

Canned Apricots

STANDARD

Canned apricots are the normally flavored and normally colored canned food consisting of (1) the normal- and uniform-sized, tender, unpeeled, mature, unblemished, pitted, unbroken halves of the fruit of the apricot tree, and (2) sugar solution.

The weight of fruit in the container is not less than three-fifths the weight of water which the sealed container will hold at 68 deg. F., except that, when necessary to prevent crushing of the fruit, a tolerance not exceeding the weight of two average pieces is allowed. The liquid portion of the finished product reads not less than 16 deg. Brix (read at the proper temperature for the instrument used).

MEANING OF TERMS

The term "normally colored," as it relates to the fruit, means a general effect of yellow. Units of ½ oz. or larger are considered of normal size. The units shall be considered uniform in size if the transverse diameter of any unit does not vary more than 12.5 per cent from the corresponding average diameter of the pieces of fruit in the container.

The fruit shall be considered tender when the flesh of not less than 80 per cent of the units by count is completely perforated by a cylindrical rod, $\frac{7}{16}$ in. in diameter, under a load of 300 grams (approximately 10.6 oz.), applied vertically to the exposed, peeled surface of a test piece carefully placed on an appropriate support. In performing this test, the rod is placed on the exposed surface under an initial load of 100 grams and the load increased at a uniform, continuous rate of 12 grams per second until the piece is perforated. The test piece is conveniently supported on a rigid, convex surface of such curvature as to fit into the seed cavity and permit it to maintain its normal shape. The peel is conveniently removed with pointed, sharp scissors. The fruit shall not, however, be so soft that the pieces in the can lose their natural shape when the container is opened and the product is carefully removed to a dish.

The fruit shall be considered unblemished if 80 per cent or more of the pieces in the container are free from scabs, bruises, frost bites, sunburn, hail injury, green or brown colorations, or other unsightly blemishes, and no piece shows blemishes in excess of 10 per cent of its convex area.

The fruit shall be considered as unbroken halves when 80 per cent or more of the units are unbroken and not excessively trimmed. Excessive trimming is defined as that amount which destroys the normal shape of the half.

The weight of the fruit in the container means the fruit material in both the solid and liquid components. It is thus equivalent to the "put-in weight."

EXCEPTIONS

Canned apricots which fail to meet the above standard only in that they consist of apricots packed in water, need not bear the low-quality legend if labeled "water-pack apricots."

Canned apricots which fail to meet the above standard only in that the halves are peeled, need not bear the low-quality legend if labeled "peeled apricots."

Canned apricots which fail to meet the above standard only in that they consist of unpeeled, whole apricots, need not bear the low-quality legend if labeled "whole apricots," even though the units may fail to meet the requirement for normal size.

Canned apricots which fail to meet the above standard only in that they consist of uniformly sliced, peeled apricots, need not bear the low-quality legend if labeled "sliced, peeled apricots." In such cases the requirement of not less than ½ oz. in weight shall be changed to not less than 1/20 oz. for each unit.

*Wire of a uniform diameter, not less than 0.04 nor more than 0.07 in.

†These percentages do not refer to the proportion of "red" to "green" tomatoes in the container. They are rather the precise physical terms necessary to define color accurately in a legal standard. Conformity to the minimum color requirement may be conveniently judged by certain commercial color-measuring devices. For example, the color of a given sample may be matched by the following combination of Munsell color disks:

(1) 5R 2.6/13 (glossy finish)
(2) 2.5YR 5/12 (glossy finish)
(3) N 1/ (glossy finish)
(4) N 4/ (glossy finish)

If the exposed area of disk (1) covers one-third or more of the circle, and the exposed area of disk (2) does not exceed that of (1), the sample meets the minimum color requirement, regardless of the exposed area of disks (3) and (4).

Flood of Margarine Laws Pass State Legislatures

THE legislatures of 36 states considered margarine bills of one kind or another during the 1931 sessions, according to a summary of such measures appearing in the *United States Daily*. Laws have been passed in twenty of these, and others are still pending in states in which the legislatures have not yet adjourned.

Ten states put a tax on the product: Idaho, Minnesota, North Dakota, Oklahoma, Oregon, South Dakota, and Tennessee of 10c. per lb.; Nebraska and Washington of 15c. per lb., and Iowa of 5c. per lb. The 15c. tax in Nebraska applies to margarine that does not contain 50 per cent of animal fats or oils produced in United States; the 15c. Washington tax applies to those which do not contain 80 per cent milk or butter fat.

License laws for manufacturers or dealers, or both, were passed in nine states, and several more are pending. Manufacturers' license fees range from $5 up to $1,000 in Wisconsin and North Dakota. In Montana, wholesalers must pay $500 per quarter, and retailers $150 per quarter.

The sale of margarine colored yellow in imitation of butter has been prohibited in six states, New York, New Hampshire, Ohio, Oregon, Vermont, and Montana, as a result of laws passed this year. A number of the other laws which have been approved forbid the purchase of butter substitutes in state institutions. Altogether, over 100 bills on this subject were introduced. Thirty-one of these have been passed and approved and a number of others probably will receive favorable action before the legislatures adjourn.

California Grape Industry Plans Surplus Control

PLANS are being made to take care of a 400,000-ton surplus of the California grape industry this year. The 1931 plan comprises three steps. First, the withdrawal of the 1930 carry-over of raisins on Oct. 1 in tonnage up to 30,000 tons, or the equivalent of 120,000 tons of fresh grapes, from any competition with the crop of 1931. This means that on Oct. 1 the raisin market will be free of carry-over raisins for the first time in many years. The 30,000 tons withdrawn will be turned into byproducts, probably commercial alcohol.

The second step calls for the formation in the raisin pool of a so-called surplus pool which will take care of all raisins produced in 1931 in excess of what the normal market will take care of before the 1932 crop comes in.

The third step calls for the delivery of 100,000 tons of fresh table and juice grapes to Fruit Industries for conversion into byproducts.

Unlike last year's plan, there is no provision for the purchase of grapes on the vine. The financing of the surplus purchases will be carried out the same way as last year: namely, by the stabilization fee of $1.50 a ton paid by the growers. Advances to raisin growers by the California Raisin Pool will be the same as last year; that is, 2½c. on extra standard and 2c. on standard grades. There will be a small advance also on surplus raisins, the amount of which has not yet been determined.

Other phases of the control board plan call for the removal of a permanent surplus by vine pulling, and the extension of the growers' contract calling for payment of stabilization fee without withdrawal privilege to 1935.

Foodstuff Imports in 1930 Show Big Decline

THE value of imports of foodstuffs for 1930, compared with recent years, shows a decided decline to $693,701,000, or a decrease of more than 28 per cent compared with 1929 and 1928, according to the Commerce Department's Foodstuffs Division. This decline in value is partially accounted for by the lower level of world prices. However, the quantity imported also shows considerable decreases.

Imports exceeded exports by $152,519,000, or 28 per cent, approximately the same percentage as shown for the past two years. The value of all foodstuffs imported during 1930 constituted 22.7 per cent of the total value of all imports into this country, and the value of all foodstuffs exported constituted 14.3 per cent of the total of domestic exports.

Sugar, coffee, cocoa, tea, spices, nuts, fish, fresh vegetables, and feeds and fodders are the principal items for which imports exceed exports. Fresh vegetables and feeds and fodders are the only competitive products in this list showing an unfavorable trade balance.

Imports of vegetables and vegetable products totaled $36,844,000 in value, a decline of 23.4 per cent compared with 1929. Dried beans, potatoes, and tomatoes are the principal fresh vegetables imported, with Japan, Canada, and Mexico, respectively, the chief sources of supply. Canned tomatoes and tomato paste, with Italy the principal country of origin, constituted the leading imports of vegetable products.

Imports of meats and meat products declined heavily during 1930, compared with 1929, totaling 97,279,000 lb., with a value of $26,969,000, compared with 207,517,000 lb., valued at $42,574,000, a year ago. This decrease is especially noted in the imports of fresh and canned beef. Although a few varieties of fish, especially shellfish, show increased imports, total imports declined 22,880,000 lb. in quantity and $4,301,000 in value, aggregating 346,680,000 lb. with a value of $35,471,000.

The trade in cheese, the only dairy product imported to any extent, amounted to 68,311,000 lb., valued at $18,249,000, a decline of 10.6 per cent in quantity and 18.1 per cent in value. Imports of dried and frozen eggs declined from 26,030,000 lb. in 1929 to 16,157,000 lb. in 1930, with a still greater decline in value.

The total value of imports of grains and grain products aggregated $24,084,000, an increase of $4,081,000 compared with 1929. This increase occurred chiefly in the imports of wheat from Canada for milling in bond. Some increase is shown also in the imports of corn, owing largely to the small domestic crop and low prices of the Argentine crop.

Chocolate Is Candy

Sweet chocolate and sweet milk chocolate are candy, the U. S. Supreme Court has decided. The effort of the Hershey Chocolate Co. and three other manufacturers to recover $8,000,000 paid under protest during the period following the war when the "luxury" tax on candy was in effect has thereby come to naught.

Originally decided in favor of the government by a district court, the decision was reversed by the Circuit Court of Appeals, which upheld the contention of the makers that the products were primarily foods. The final decision, announced on May 18, followed a rehearing before the Supreme Court brought by the government.

That sugar is an important ingredient of sweet chocolate, and that pieces of sweet chocolate are often included in packages sold as candy were factors in the decision, according to Justice Stone.

Fundamentals of Production Stressed as Mapes Law Aid

MANY packers of canned foods must learn, or relearn, the fundamentals of production of good-quality canned foods, as a direct result of the recently enacted Mapes amendment to the Food and Drug Act. This fact was the outstanding development of the joint meeting of the Baltimore Canned Foods Exchange, the Pennsylvania Canners' Association, and the Tri State Packers' Association, Inc., held on May 18 at Baltimore to consider the effects of application of the minimum standards for labeling canned peas and canned tomatoes recently announced.

The viewpoint was expressed that the substandard legend, "Below U. S. Standard; Low Quality but Not Illegal" (see FOOD INDUSTRIES, Vol. 3, No. 4 [April, 1931] page 177), will have a condemning effect; it is surmised that buyers will not accept substandards at any price. A further effect, found in the penal nature of the law, will be the trouble for the packer who, wittingly or unwittingly, violates its specific provisions. Therefore, the meeting partook of the nature of a post-graduate school for canners, with particular emphasis on the fundamentals of quality production.

Many jobbers, growing apprehensive of possible untoward results of the Mapes Law, have unsuccessfully endeavored to obtain a postponement of the date of its becoming effective. Failing in this, several have demanded that canners shall sign guarantees of rather far-reaching consequence. Opposition to such unconditional guarantees until reviewed by the conference committees of the National Canners' Association and National Wholesale Grocers' Association, led to the following resolution:

Resolved. Pending the adoption by the National Canners' Association and distributors of a new suitable guarantee form through the conference committee this meeting suggests canners use the form of guarantee below only and decline to sign any other form of guarantee.

"Seller guarantees the goods sold under this contract shall not be adulterated or misbranded within the meaning of the Federal Food and Drug Act of June 30, 1906, and amendments thereto; provided, however, that the seller does not guarantee against such goods becoming substandard within the meaning of said act, as amended by the act of July 8, 1930, due to causes arising after leaving seller's control."

Proper and adequate coding of cans was shown to be the most important safeguard against difficulty under the law. Exact control of exhausting (preheating), processing, and cooling were shown to be indispensable requisites of good quality, with emphasis on proper cooling to avoid overcooking after the sterilizing process is complete. It was also brought out that indiscriminate purchase of raw material, without consideration of its effect on the quality of finished goods, is to court disaster. In other words, canners must learn to can properly, or suffer penalties.

TRADE NOTES

ARMOUR & Co., Chicago, Ill., has inaugurated a new plan of coordination of plant operations, which calls for a modified five-day week. The object is to make the work of the individual operative, and the operation of the plant also, as nearly continuous from day to day as possible, so that if less than a full week of work is required, a full holiday may be had on Saturday or Monday. Regular employees are guaranteed a minimum of forty hours of work a week. The latest branch to go under the new system is that at South St. Paul., Kansas City (Kan.), and St. Joseph (Mo.) plants are now operating on this schedule.

BRITISH COLUMBIA SUGAR REFINERY CO., LTD., has purchased the Raymond beet sugar plant in Southern Alberta from the Utah-Idaho Sugar Co. The Raymond plant was built in 1926, has a capacity of 1,000 tons of sugar beet daily, and last year sliced 127,000 tons of beets from 14,000 acres, making about 30,000,000 lb. of sugar.

CANADA DRY GINGER ALE, INC., has introduced a large-size bottle holding five full glasses as the second step in its market expansion program. The first step, the reduction in price of the smaller size bottle, produced in April the greatest sales volume in the history of the company, it has been announced.

CITY DAIRIES CO., INC., St. Louis, Mo., is now featuring a "fast-frozen" ice cream, in which small crystal structure is said to result in improved texture characteristics. J. M. HORTON ICE CREAM CO., New York City, a subsidiary of the Borden Co., has also announced a "fast-frozen" ice cream development.

CONSOLIDATED DAIRY PRODUCTS CO., Seattle, Wash., has received offers for acquisition from both National Dairy Products Corp. and Beatrice Creamery Co. National Dairy offered the equivalent of about $9.93 a share after an offer equivalent to about $8.45 a share by Beatrice. A stockholders' meeting to consider the offers was to be held on May 25, following failure to obtain a quorum on May 13.

DEFIANCE MILK CO., Defiance, Ohio, has been incorporated with a capital of $150,000. The incorporators are Albert F. Diehl, John C. Diehl, and Harry S. Vroman.

GENERAL FOODS CORP., New York City, has opened a "radio kitchen" from which its biweekly food broadcasts will be made. Completely equipped from both electrical and dietetic standpoints, the kitchen is expected to add realism to recipes and radio talks.

JOHN JAY, INC., has been chartered with a capital of $100,000 at Syracuse, N. Y., to establish and operate a food packing plant.

LADOGA CANNING CO. has acquired a controlling interest in the SEARS & NICHOLS CORP., a newly organized Indiana corporation that has bought the properties of the Sears & Nichols Co. of Ohio, according to the *Journal of Commerce*. W. C. Bachelder and Edgar Ashby are president and secretary, respectively, of the new corporation. The new company will maintain the same quality of products, with Evan Reicheldorfer as production manager. The sales office will remain at Chillicothe, Ohio.

MARSHALL CANNING CO., Marshalltown, Iowa, is introducing three new canned products: creamed chicken, creamed chipped beef, and creamed codfish.

NATIONAL DAIRY PRODUCTS CORP. has submitted plans for acquisition of the Golden State Milk Products Co., San Francisco, Calif., and the merger has been approved by the board of directors of the latter concern. National Dairy would exchange one share of stock for each two shares of Golden State. The Golden State organization operates 65 plants on the West Coast, and would be the largest addition to National Dairy since Kraft-Phenix Cheese Corp. was acquired. Opposition to the merger, led by two members of the board of directors of Golden State, indicates a proxy fight between shareholder groups before the arrangement is completed.

NORTH PACIFIC CANNERS & PACKERS, INC., a grower-owned and controlled regional cooperative marketing agency, has been formed with the assistance of the Federal Farm Board. The six member associations are: Washington Canners' Cooperative, Vancouver, Wash.; Gresham Berry Growers, Gresham, Ore.; Springbrook Packing Co., Springbrook, Ore.; Silverton Food Products Co., Inc., Silverton, Ore.; Puyallup and Summers Fruit Growers' Association, Puyallup, Ore.; Stayton Canning Co. Cooperative, Stayton, Ore. These six member associations handled a business aggregating $3,000,000 during the 1930-31 season. J. J. Fisher, Gresham, Ore., is president.

PET MILK COMPANY has begun the manufacture of American cheese at its condensery at Monticello, Wis. About 10,000 lb. of its daily milk supply is being converted into cheese at this plant, and plans are under way to double this capacity. Cheese is also being produced at the Belleville (Wis.) plant of this organization.

SCHULZE BAKING CO., Springfield, Ill., has purchased the Tebelman Baking Co., and has transferred the equipment of the latter to its own plant. Here it will continue to make the cake specialties formerly made by the Tebelman company.

UNILEVER, INC., British holding company with an international business in fish, oils, soaps, and the like, will build a factory in New Jersey for the manufacture of "edibles," according to F. Darcy Cooper, chairman. The location and type of plant were not announced.

PERSONALS

STEFAN ANSBACHER has resigned from the laboratory of the South Carolina Food Research Commission, Charleston, S. C., to join the research staff of the Dry Milk Co., at Bainbridge, N. Y.

HOWLAND BUTLER, formerly assistant chief chemist at Anheuser-Busch, Inc., St. Louis, Mo., has been made chief chemist of Dr. Pepper Co., Dallas, Tex., beverage manufacturer.

MILO R. DAUGHTERS, formerly of the research department of the Continental Can Co., has joined the General Seafoods Corp., a subsidiary of General Foods Corp., and will be connected with frozen foods activities on the Pacific Coast. He will be in charge of the temporary research laboratory located at the plant of the Ray-Maling Co. at Hillsboro, Ore. Mr. Daughters has previously been employed by Dominion Canners, Inc. and Sprague-Sells Corp. He was connected with the Wheeling Can Co. when it was absorbed by Continental Can.

E. W. GARBISCH has been elected president of the Cellulose Products Corp., New York City, a company recently organized to manufacture a cellulose tissue. Mr. Garbisch was previously vice-president and sales manager of Post Products, Inc., a division of General Foods Corp.

ROY M. HAGEN has resigned as manager of the Sun-Maid Raisin Growers' Association. He will join the Standard Oil Co. of California. In his new capacity he will be associated with the management of the Pacific Public Service Co., a Standard Oil subsidiary. It is the interests of this subsidiary that have been considered an important factor in the recent frozen-foods venture in which the Standard Oil Co. of California and General Foods Corp. are jointly associated.

JOHN HORTER, for more than thirty years secretary of Jewett & Sherman Co., Milwaukee, Wis., food packer, has been elected president of the company. LEWIS SHERMAN, former president, has been made chairman of the board. Mr. Horter entered the organization in 1877 as office boy.

E. R. JAGENBURG, former vice-president and general manager of the Crown Fruit & Extract Co., Inc., recently joined the staff of A. A. Lund & Associates, food research and merchandising engineers. Mr. Jagenburg will have charge of the fruit product development work.

WILLIAM N. KEELER has been named general manager of the Sun-Maid Raisin Growers' Association to succeed Roy M. Hagen, it was announced on May 19. Mr. Keeler was formerly attorney for the group.

JOHN V. KLOCKLOV has been engaged by the Belgian Trading Co., New York City, and will have charge of the manufacture of non-alcoholic synthetic flavoring materials for candy and ice cream. For the past three years he has been

chief chemist for M. R. Rodgers & Co., Seattle, Wash.

C. E. LACHELE has joined the staff of the National Canners' Association research laboratory at San Francisco, Calif., to succeed Paul Wilbur, who recently entered the research laboratory of the American Can Co. at Maywood, Ill.

J. D. MALCOMSON, manager of the research engineering division of Robert Gair Co., has been appointed a member of the standing committee in charge of recommendations on folding and corrugated boxes under the Division of Simplified Practice of the U. S. Department of Commerce.

L. B. MENDEL, professor of physiological chemistry at Yale University, and E. B. HART, professor of agricultural chemistry at the University of Wisconsin, have accepted appointment by the U. S. Department of Agriculture as advisors to its protein and nutrition division in the Bureau of Chemistry and Soils.

WARREN H. SAPP, formerly assistant comptroller of Armour & Co. at Chicago, Ill., has been appointed general manager of the Chicago plant. He will have the task of building up a separate office force from that engaged in the general administration of the business. A trained accountant, lately elected president of the Illinois Manufacturers' Association accounting division, Mr. Sapp also has had a number of years' experience in plant operation.

ARTHUR C. UNGER, Western division sales manager; RALPH H. WHITMORE, Pacific Coast Division manager; and JOHN K. EVANS, Eastern division manager, of the General Foods Sales Co., have been elected vice-presidents of the organization.

OBITUARY

BERNARD A. ECKHART, one of the founders of the Eckhart Milling Co. and for many years its head, died May 11 at his home in Chicago, aged 79. He was born in Alsace, France, and began his connection with the milling industry in Milwaukee in 1868. He was first president of the Millers' National Federation when it was organized in 1902, and also served as a member of the Illinois State Senate, president of the Illinois Manufacturers' Association, and president of the Sanitary District of Chicago. He also served in the U. S. Food Administration during the World War. He was also a director of the Erie Railroad; Dodge Bros., Inc.; Armour & Co.; and Montgomery Ward & Co., as well as several financial institutions.

HUGH C. GALLAGHER, former chairman of the board and president of Walter Baker & Co., Inc., chocolate and cocoa manufacturers, died on May 4 after a brief illness at his home in Milton, Mass. He was 75 years old and had retired from the organization a number of years ago.

WHITMAN H. JORDAN, director of the New York State Agricultural Experiment Station at Geneva, N. Y., from 1896 to 1921, died at Orono, Me., on May 8. He was 79 years of age and had been in poor health for several years. Mr. Jordan directed the Maine State Experiment Station for several years before his 25 years of service at Geneva began. He was an authority on human and animal nutrition, and was author of "Principles of Human Nutrition" and "The Feeding of Animals."

HENRY A. KRUMM, for many years affiliated with the Krumm Milling Co., Columbus, Ohio, died last month at his home in that city, after an illness of several years. He was 58 years of age.

ARTHUR J. WOOD, head of the department of mechanical engineering at Pennsylvania State College, died on April 18 from injuries received when he was struck by a motorcycle. Prof. Wood was an authority on refrigeration, and played a large part in the development of the modern refrigerator car. He was born in Newark, N. J., in 1874.

NEW CONSTRUCTION

Bakery—Classen Sons Inc., 2368 Silver St., Ridgewood, N. Y., plans a 3 story, 75 x 109 ft. bakery and garage at Hughes and 60th St. Estimated cost $50,000. W. Fuhrer, c/o owner, is architect.

Bakery—Continental Baking Co. Inc., 14th St., Hoboken, N. J., will soon award contract for alterations to bakery plant at Park Ave. and 14th St. Estimated cost $40,000. Private plans.

Bakery—Dept. of Mental Hygiene, Municipal Bldg., New York, N. Y., awarded contract for the construction of a bakery at Craig Colony for Epileptics at Sonyea to Daniel Elander Inc., 341 East 3rd St., Jamestown. $29,794.

Bakery — B. Manischewitz Co., 2100 West 8th St., Cincinnati, O., acquired a building at 143-51 Bay St., Jersey City, N. J., and plans to remodel for bakery. Estimated cost to exceed $60,000. Architect not selected.

Bakery — John J. Nissen Baking Co., 59 Washington Ave., Portland, Me., plans addition and alterations to bakery on Washington Ave. Estimated cost $40,000. McCormick Co., 121 South Negley Ave., Pittsburgh, Pa., is engineer.

Bakery—National Biscuit Co., 89 9th Ave., New York, N. Y., is preparing plans for a bakery. Estimated cost to exceed $1,000,000. Maturity soon.

Bakery—Puritan Baking Co., 286 Terrill Rd., Plainfield, N. J., plans the construction of a 1 story bakery. Estimated cost $40,000. C. C. Bell, 17 North Ave. E., Cranford, Plainfield, is architect.

Bakery—Fred Schreiber, c/o G. W. Backoff, 623 Broad St., Newark, N. J., Archt., will soon award contract for addition and alterations to bakery and store at 872 Newark Ave., Jersey City. Estimated cost $40,000.

Bakery Addition—Genest Bros., 640 Harvard St., Manchester, N. H., awarded contract for addition and alterations to bakery to J. Pomerleau, 122 Laval St., Manchester. Estimated cost $40,000.

Bottling Plant—Coca Cola Bottling Co., 310 North Ave. N. W., Atlanta, Ga., awarded contract for the construction of a 2 story, 71 x 130 ft. bottling plant and garage at Beaumont, Tex., to Christy Dolph & Collins, Beaumont. $73,000.

Bott'ing Plant—Graham Ice Cream Co., 1510 Jones St., Omaha, Neb., will build a 4 story, 40 x 80 ft. bottling plant at Norfolk, by day labor. Estimated cost $75,000.

Brewery—F. and M. Schaefer Brewing Co., Kent Ave. and South 10th St., Brooklyn, N. Y., awarded contract for the construction of an 8 story brewery and storage building to Waldemar Montenson, 103 Park Ave., New York. Estimated cost to exceed $100,000. Maturity about July 1.

Winery—Grapegrowers Wines Ltd., Winona, Ont., is having plans prepared for the construction of a 2 story, 125 x 250 ft. winery. Estimated cost $100,000. Kaplan & Sprachman, 305 Dundas St., Toronto, are architects. Interested in prices on complete equipment.

Canning Plant (Vegetable)—J. C. Dunn Co., San Juan, Tex., interested in prices on one crane, 12 qt. capacity pails, three peeling tables (revolving) retorts, retort crates, washer and scalder, etc., for proposed vegetable canning plant at Muleshoe.

Canning Plant—Fine Foods of Canada Ltd., 37 LaBelle Bldg., Windsor, Ont., subsidiary of Minnesota Valley Canning Corp., Le Sueur, Minn., plans the construction of a 1 and 2 story canning plant at Tecumseh. Estimated cost $1,000,000. A. J. Lothian, LaBelle Bldg., Windsor, is architect. H. Gerlack, Le Sueur, Minn., is associate architect.

Confectionery Factory — Goldo Brand Confectionery Co., Everett St., Brighton, Mass., awarded contract for addition and alterations to factory to N. Berman, 33 Wenonah St., Roxbury. Estimated cost $40,000.

Creamery—Blue Valley Creamery Co., West and Market Sts., Indianapolis, Ind., awarded contract for a 2 story, 60 x 90 ft. creamery to W. Van Landingham, 309 Lemcke Bldg., Indianapolis. Estimated cost $40,000.

Creamery—Challenge Creamery & Butter Co., 307 Montgomery St., San Francisco, Calif., awarded contract for a 2 story creamery at 18th and York Sts. to Monson Bros., 475 6th St., San Francisco. Estimated cost $115,560.

Creamery—Chamber of Commerce, Holdenville, Okla., is having preliminary plans prepared for the construction of a co-operative creamery. Estimated cost $30,000. Private plans.

Creamery—Inter-Lake Co-Operative Creamery Association, B. Anderson, Secy., Browns Valley, Minn., awarded contract for a 2 story, 56 x 68 ft. creamery to H. B. Kenney Co., 529 Plymouth Bldg., Minneapolis. Estimated cost $31,000.

Dairy Plant—Co-Operative Dairy Co., Cedar Rapids, Ia., awarded contract for the construction of a dairy plant to J. W. Hopp Construction Co., 415 Granby Bldg., Cedar Rapids. $40,886.

Dairy—Sibley Farms, J. R. Sibley, Spencer, Mass., awarded contract for a dairy including refrigeration, etc., to J. W. Bishop Co., 109 Foster St., Worcester. Estimated cost $25,000.

Dairy — Titusville Dairy Products Co., H. Rabild, Pres. and Mgr., South Washington St., Titusville, Pa., had plans made for a 1 and 2 story dairy. Estimated cost $50,000. Braziell & Anderson, 309 4th Ave., Pittsburgh, are architects.

Dairy Plant — Weissglass Dairies Co., 2014 Forest Ave., Mariners Harbor, S. I., N. Y., will soon award contract for the construction of a 1 story dairy plant on Forest Ave. Estimated cost $40,000. H. W. Pelcher, 286 Richmond Ave., Port Richmond, S. I., is architect.

Ice Cream Plant—Harding Cream Co., W. R. Davis, Mgr., Columbus, Neb., will build a 1 story, 66 x 121 ft. ice cream plant, including side loading docks at West End 12th St. Estimated cost $60,000. Work will be done by local labor.

Ice Cream Plant—G. E. Wells, Security Bldg., St. Louis, Mo., plans addition to plant of Valley Sanitary Milk Co. at Mercedes, Tex., recently acquired.

Milk Station—Whiting Milk Co., 570 Rutherford Ave., Charlestown, Mass., plans the construction of a milk station at Wareham. Estimated cost $50,000. Private plans.

Milk Distribution Plant—Sheffield Farms Co., 524 West 57th St., New York, N. Y., awarded contract for a milk distribution plant at Montauk Highway, Hampton Bays, Long Island, to Buryea-Baird Co., Windmill Ave., Southampton, L. I. $40,000.

Cold Storage Plant — Fruit Growers Cold Storage Co., 16 Wall St., Watsonville, Calif., awarded contract for a 1 story cold storage plant on Salinas Rd. to P. T. Wallstrum, 217 Center St., Watsonville. Estimated cost $180,000.

Cold Storage Plant — Georgian Bay Fruit Growers, Clarksburg, Ont., will receive bids until May 30 for the construction of a 1 story, 70 x 70 ft. cold storage plant, including refrigeration equipment, also plans fruit packing plant. E. H. Darling, Piggott Bldg., Hamilton, is engineer.

Cold Storage Plant—Commonwealth of Massachusetts, W. A. Merrill, State House, Boston, Mass., is having plans prepared for the construction of heating and cold storage plant, including boilers, piping and stoker at Monson. Estimated cost $300,000. E. C. Brown Co., 77 Summer St., Boston, is engineer.

Cold Storage Plant — Prince Edward County Co-Operative Ltd., Picton, Ont., awarded contract for the construction of a cold storage plant for fruits and vegetables, including artificial refrigeration system, etc., to J. Stacey, Quinte St., Trenton, Ont. Estimated cost $100,000.

Cold Storage Plant—Syms-Shafer Grocery Co., Colby, Kan., will soon award contract for a 2 story, 60 x 237 ft. cold storage plant. Estimated cost $45,000 excluding equipment. B. H. Byrnes, 312 National Bank of America Bldg., Salina, is architect.

Ice Manufacturing Plant — Electro Ice Co., Commercial St., Holyoke, Mass., awarded contract for a 1 story, 65 x 100 ft. ice manufacturing plant on Commercial St. to P. J. Kennedy & Co. Inc., 326 Appleton St., Holyoke. Estimated cost $40,000.

Ice Manufacturing Plant—Union Ice Co., 354 Pine St., San Francisco, Calif., awarded contract for a 1 story, 100 x 126 ft. ice manufacturing plant at Redwood City, to W. W. Williamson, 320 Market St., San Francisco.

Ice Plant—Greenfield Ice & Trucking Co., B. C. Phelps, 50 Union St., Greenfield, Mass., will soon award contract for the construction of a 1 story artificial ice plant on Bernardston Rd. Estimated cost $40,000. R. E. Palmer, 58 Suffolk St., Holyoke, Mass., is engineer.

Ice Plant—W. S. Grimes and W. D. Little, Hillsboro and Fort Worth, Tex., are having plans made for a 60 ton ice plant at Hillsboro. Estimated cost $50,000. Private plans.

Ice Plant — Sands Bros., 1099 Goffle Rd., Hawthorne, N. J., plans to rebuild plant recently destroyed by fire at Goffle and Rock Rds. Estimated cost $40,000. Architect not selected.

Ice Plant — Shippers Co-Operative Ice Co., Crystal City, Tex., is receiving bids for the construction of a 1 story ice plant. Estimated cost $150,000. Private plans.

Ice Plant Improvements—Central Power & Light Co., Alamo Bank Bldg., San Antonio, Tex., acquired electric and ice properties in Aransas Pass, Rockport, Balside, Ingleside and Fulton and plans improvements consisting of enlargement and replacement of machinery, etc. Private plans.

Storehouse, etc. — Metropolitan Ice Co., 321 Washington St., Somerville, Mass., awarded contract for a 1 story storehouse, store and filling station at Pacific and Brookline Sts., Cambridge, to E. D. Ward Co., 82 Foster St., Worcester. Estimated cost $40,000.

Pre-Cooling Plant—Orange Mutual Citrus Association, Orange, Calif., awarded contract for a 2 story, 85 x 135 ft. pre-cooling plant to Adolph G. Schmid, 200 Builders Exchange Bldg., Santa Ana. Estimated cost $80,000.

Pre-Cooling Plant—Union Ice Co., 354 Pine St., San Francisco, Calif., plans the construction of a pre-cooling plant at Arbuckle. Estimated cost $40,000. Private plans.

Food Packing Plant and Warehouse—Great Atlantic & Pacific Tea Co., 420 Lexington Ave., New York, N. Y., plans the construction of a food packing plant and warehouse on Hamburgh St., Buffalo. Estimated cost to exceed $40,000. Private plans.

Grocery Warehouse — S. M. Flickenger, 79 Perry St., Buffalo, N. Y., (wholesale grocer), awarded contract for a 2 story, 150 x 160 ft. warehouse at Bailey and Clinton Sts., to J. W. Cowper Co., Niagara Sq., Buffalo. Estimated cost $100,000.

Potato Plant—C. H. Turner and H. G. Smith, Cleveland, Tex., plan the construction of a sweet potato plant, 20,000 bu. capacity.

Health Products Plant—Health Products Co., 113 North 13th St., Newark, will build a 2 story addition to plant. Estimated cost $40,000. Private plants. Work will be done by separate contracts.

Salt Plant — Arden (Vancouver) Salt Co., Vancouver, B. C., has work under way on the construction of a 1 story, 88 x 135 ft. plant at 85 West First Ave. Estimated cost $34,000.

Flour Mill—General Foods Inc., R. K. MacIntosh, Mgr., Windsor, Ont., plans the construction of a flour mill. Estimated cost $75,000.

Grain Elevator — Cargill Elevator Co., 760 New Chamber of Commerce Bldg., Minneapolis, Minn., awarded contract for the construction of a grain elevator, 5,000,000 bu. capacity at Omaha, Neb., to Fegles Construction Co., 711 Wesley Temple Bldg., Minneapolis.

Grain Elevator — Blackwell Mill & Elevator Co., Blackwell, Okla., awarded contract for the construction of a grain storage elevator, 500,000 bu. capacity, to Burrell Engineering & Construction Co., 1 North Canal St., Chicago, Ill. Estimated cost $100,000.

Grain Elevator — Fort Worth Elevator & Warehouse Co., 510 East First St., Fort Worth, Tex., awarded contract for a grain elevator, 3,000,000 bu. capacity, to Southwestern Engineering Co., McDaniel Rd., Springfield, Mo.

Grain Elevator—Larabee Flour Mills Co., C. N. Arnold, Mgr., Wellington, Kan., awarded contract for rebuilding grain elevator destroyed by fire, to McKenzie & Haig, 422 Corn Exchange Bldg., Minneapolis, Minn.

Grain Elevator—Nye-Jenks Grain Co., 320 Grain Exchange Bldg., Omaha, Neb., awarded contract for the construction of a grain elevator, 350,000 bu. capacity at Council Bluffs, Ia., to Burrell Engineering & Construction Co., 1 North Canal St., Chicago, Ill.

Grain Elevator—St. Louis Merchants Bridge Railroad Co., Owner of Ground, and Ralston Purina Co., 835 South 8th St., St. Louis, Mo., Owner of Bldg., awarded contract for a 50 x 112 ft. grain elevator at 808 Gratiot St., to Jones-Hettelsater Construction Co., 600 Mutual Bldg., Kansas City. Estimated cost $250,000.

Grain Elevator—Shawnee Milling Co., J. L. Ford, Pres., Shawnee, Okla., awarded contract for an addition to grain elevator, 300,000 bu. capacity, to Jones-Hettelsater Construction Co., 600 Mutual Bldg., Kansas City, Mo.

Grain Elevator—Whittemore Grain Co., R. S. McSorley, Rosindale, Mass., plans the construction of a grain elevator on Harrison St. Estimated cost $40,000. Private plans.

Grain Elevator—Welch Bros., Dalhart, Tex., are having preliminary plans prepared for the construction of a grain elevator on Chicago, Rock Island and Pacific R.R. tracks.

Grain Elevator—Wolcott & Lincoln Inc., 801 Bd. of Trade Bldg., Kansas City, Mo., awarded contract for the construction of a grain elevator, 500,000 bu. capacity, including cleaning and conditioning equipment, terminal hopper scales, etc., at Wellington, Kan., to Chalmers & Borton, 1016 Baltimore Ave., Kansas City, Mo. Estimated cost $150,000.

Grain Elevator Addition—Atchison, Topeka & Santa Fe Ry. Co., 80 East Jackson Blvd., Chicago, Ill., awarded contract for addition to grain elevator, 4,000,000 bu. capacity in Argentine District, Kansas City, Mo., to J. S. Metcalf Co., 105 West Adams St., Chicago. Estimated cost $750,000. G. W. Harris, Chicago, is chief engineer. Davis, Noland, Merrill Grain Co., Bd. of Trade Bldg., Kansas City, is lessee.

Grain Elevator Addition — Barton County Flour Mills Co., Great Bend, Kan., awarded contract for addition to grain elevator, including six wheat storage bins, 150,000 bu. total capacity, 2,500 bu. hopper scale, etc., to Jones-Hettelsater Construction Co., 600 Mutual Bldg., Kansas City, Mo.

Grain Elevator Addition—Kansas City Southern R.R., 11th and Wyandotte Sts., Kansas City, Mo., will soon award contract for addition to grain elevator, 1,060,000 bu. capacity. Horner & Wyatt, 468 Bd. of Trade Bldg., Kansas City, are engineers. A. N. Reece, Kansas City, is chief engineer. Norris Grain Co., Bd. of Trade Bldg., Kansas City, is lessee.

Grain Elevator Addition—Midland Flour Milling Co., Bd. of Trade Bldg., Kansas City, Mo., awarded contract for addition to grain elevator, 400,000 bu. capacity at Blackwell, Okla., to Burrell Engineering & Construction Co., Plaza Bldg., Chicago, Ill.

Grain Elevator Addition — Wabash Ry. Co., Exchange Bldg., St. Louis, Mo., let contract for addition to grain elevator, 1,000,000 bu. capacity at North Kansas City, to Burrell Engineering & Construction Co., Daily News Plaza Bldg., Chicago, Ill. W. R. Bennett, St. Louis, is chief engineer. Uhlmann Grain Co., Bd. of Trade Bldg., Kansas City, is lessee.

Grist Mill—J. James, Consecow, Ont., plans the construction of a grist mill. Estimated cost $50,000.

Rice Mill—Canada Rice Mills Ltd., 343 Railway St., Vancouver, B. C., plans extension to existing plant including a 600 ft. berth to accommodate steamers. Estimated cost $75,000 to $100,000.

Packing Plant (Citrus)—Citrus Growers Association, J. S. Taylor, Jr., Mgr., Largo, Fla., plans to rebuild plant recently destroyed by fire. Estimated cost $75,000.

Packing Plant (Citrus)—Edinburg Citrus Association, c/o D. W. Curry, Edinburg, Tex., awarded contract for a 1 story citrus packing plant. Private plans.

Packing Plant (Citrus) — L. E. Snaveley, Harlingen, Tex., will soon award contract for the construction of a citrus packing plant at Mission. Estimated cost $75,000. Private plans. Machinery and equipment will be required.

Packing Plant Addition (Citrus) — Canoga Citrus Association, San Fernando, Calif., awarded contract for a 1 story, 81 x 114 ft. addition to citrus packing plant at Roscoe St. and Canoga Ave., to A. S. Barnes Co., 601 Title Insurance Bldg., Los Angeles. $18,500.

Packing Plants (Citrus)—Texas Citrus Fruit Growers Exchange, c/o J. Shary, Mission, Tex., is having plans prepared for the construction of a 2 story citrus packing plant at Harlingen, also 1 story plant at Santa Rosa. $60,000. H. H. Shary, Harlingan, is architect. H. H. Ewing, 1608 Dougherty St., Mission, is engineer.

Grading and Packing Plant — North Pacific Nut Growers Co-Operative Association, Vancouver, Wash., plans the construction of a grading and packing plant. Estimated cost $30,000. Architect and engineer not selected.
story, 40 x 132 ft. canning plant.

Packing Plant—San Joaquin Valley Walnut Growers Association, Linden, Calif., awarded contract for the construction of a 1 story packing plant to J. J. Cavanaogh, 219 Sutter St., Stockton, Calif. $40,000.

Fish Hatchery—Bd. of Affairs, Capitol, Oklahoma City, Okla., is having preliminary plans prepared for the construction of a fish hatchery at Pennington Creek near Tishomingo. Estimated cost $40,000. Private plans.

Packing Plant (Fish)—Bd. of Commissioners, City Hall, Seabright, N. J., postponed construction of 1 story fish packing plant. $40,000. Indefinite when project will mature.

Packing Plants—Union Socialist Soviet, Russia, c/o Amtorg Trading Corp., 261 5th Ave., New York, N. Y., had plans prepared for the construction of meat packing plants at Moscow and Semipalatinsk Kazarkatan. Estimated cost $16,000,000. Work will be done by technical aid contract. Owner now making contracts for equipment. Plans also other plants and various locations.

Poultry Plant — Wickham-Havens Inc., 1510 Franklin St., Oakland, Calif., will build a poultry plant at Concord by day labor. First unit to cost $75,000. Ultimate total cost $350,000.

Packing Plant—Armstrong Packing Co., 2300 Cockrell Ave., Dallas, Tex., will soon award contract for the construction of a 4 or 7 story, 90 x 90 ft. addition to packing plant. Estimated cost $250,000.

Packing Plant—Cleveland Provision Co., H. A. Schantz, Pres., 2527 Canal Rd., Cleveland, O., awarded contract for a 2 story, 88 x 110 ft. packing plant at 3378 West 65th St., to A. A. Lane Construction Co., 1875 East 55th St., Cleveland. Estimated cost $150,000.

Packing Plant — John Duff & Sons Ltd., Hillyard St., Hamilton, Ont., awarded contract for a 2 story, 75 x 150 ft. packing plant, including steam heating and refrigeration systems, to Frid Construction Co., Terminal Bldg., Hamilton. Estimated cost $125,000.

Packing Plant—San Francisco Packing Co., Phelps and Williams Sts., San Francisco, Calif., awarded contract for a 1 story warehouse on Phelps St., to Cahill Bros., 206 Sansome St., San Francisco. Estimated cost $40,000.

Packing Plant Addition — Duquoin Packing Co., Duquoin, Ill., awarded contract for a 1 story, 30 x 78 ft. addition to packing plant to A. H. Haeseler Building & Contracting Co., Wainwright Bldg., St. Louis, Mo. $15,000.

Packing Plant Addition — Waldock Packing Co., F. P. Waldock, Pres., Sandusky, O., awarded contract for a 2 story addition to plant, to Zeiher & Miller, Sandusky. Estimated cost $50,000.

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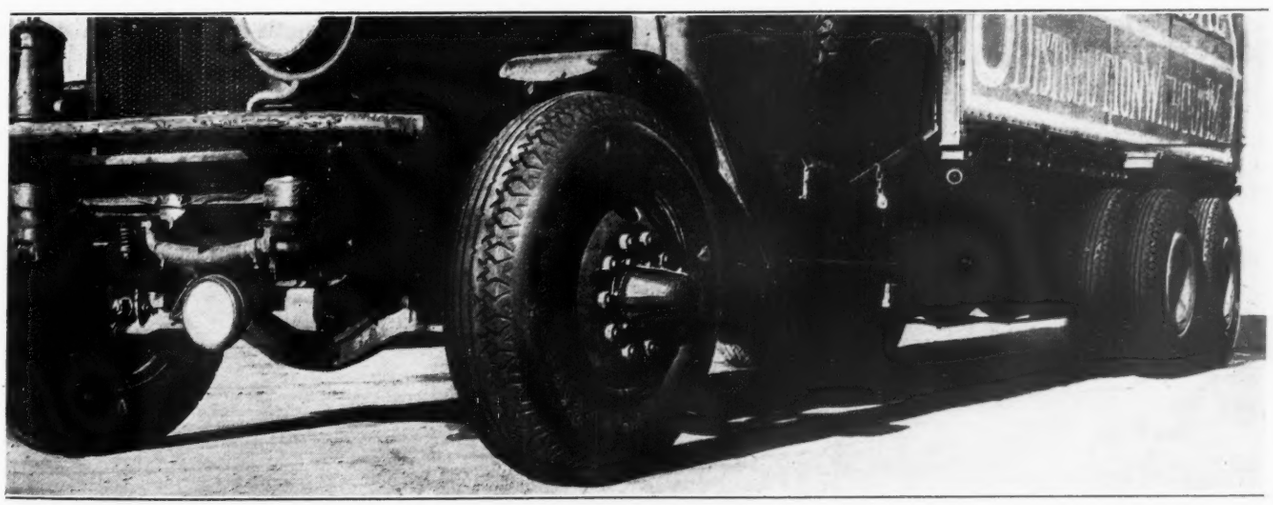

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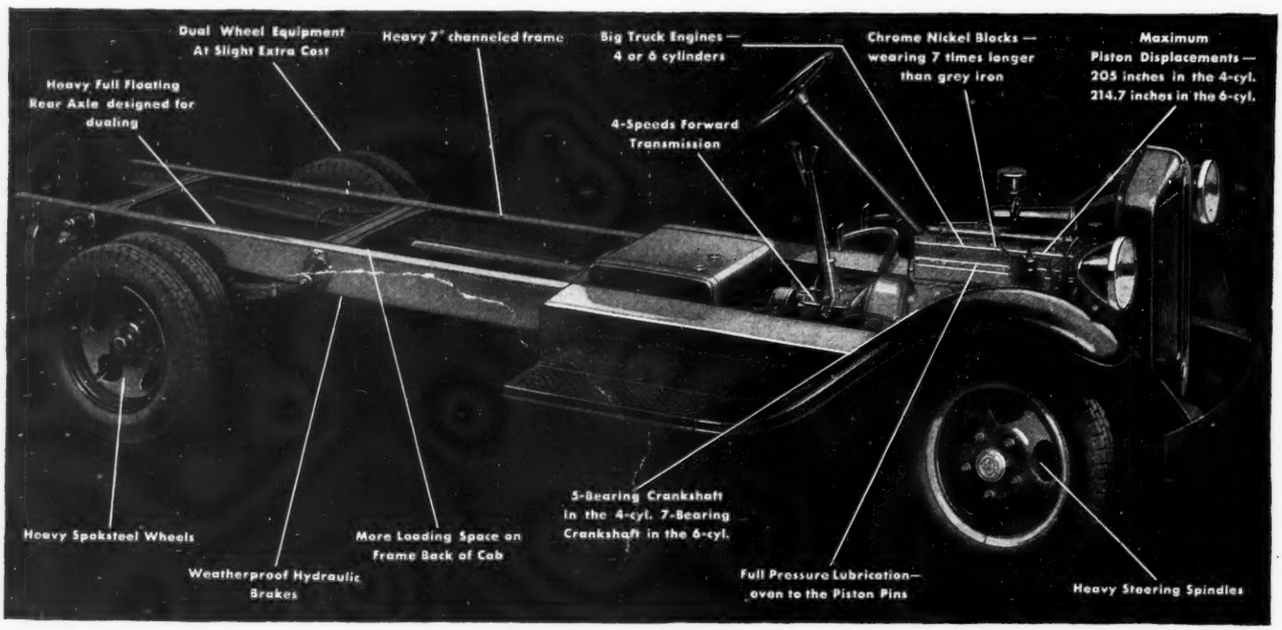
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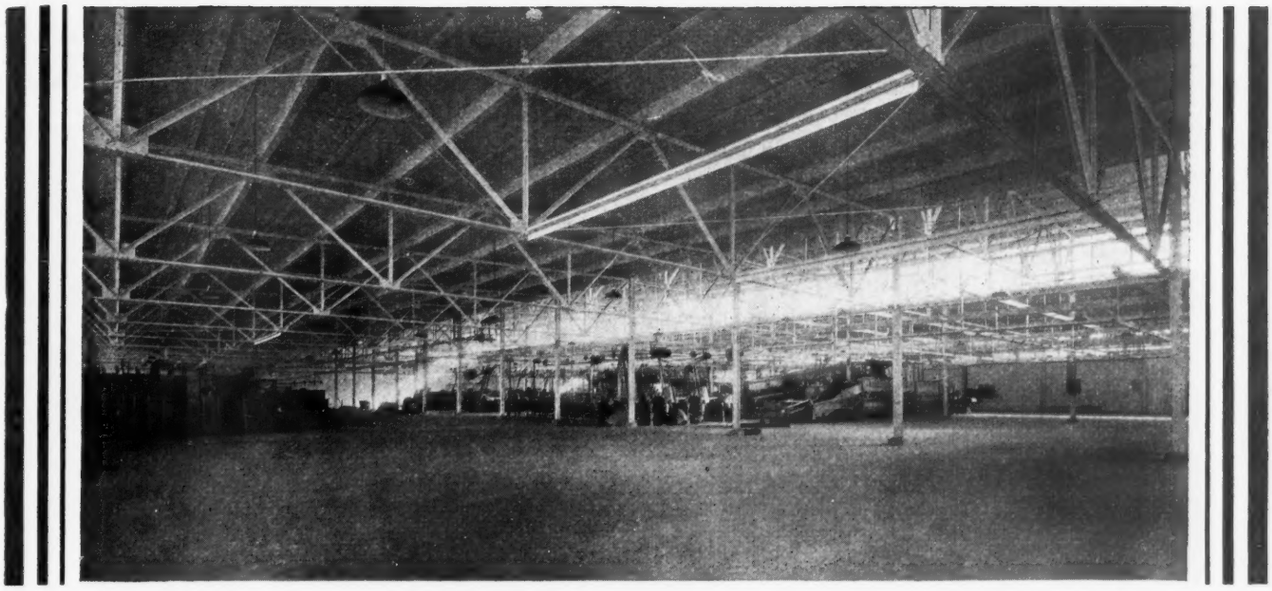

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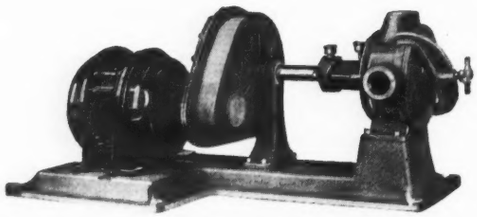

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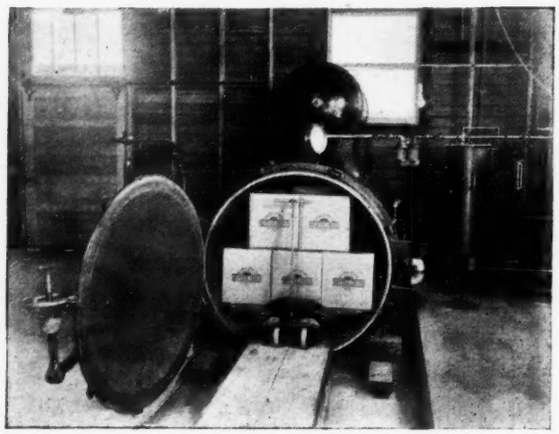

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★ We are pleased to announce that the Food Machinery Corporation, with Offices in New York, San Francisco and San Jose has been appointed national distributor for

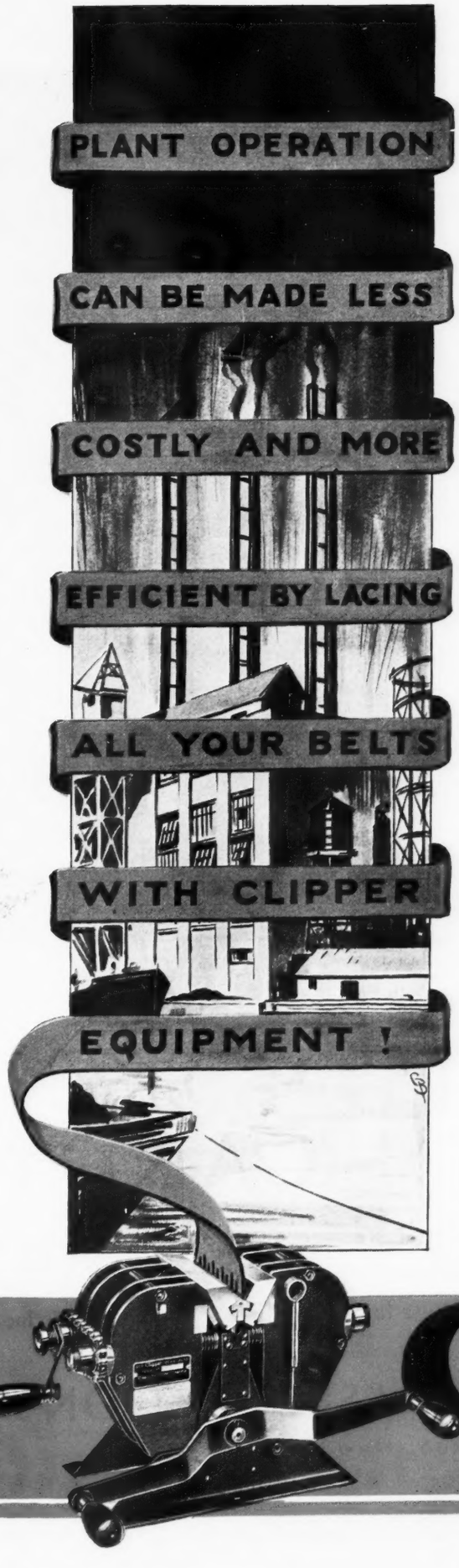
VACUFUME

★ If you manufacture any product subject to insect infestation, it would pay you to communicate with the Food Machinery Corporation and learn from them the full details on the Vacufume.

UNION
TANK & PIPE CO., Ltd.

Mechanical Engineers, Manufacturers of Steel Plate and Sheet Metal Products.

2801 SANTA FE AVENUE
Los Angeles, California



QUALITY BELT LACING

Leading industrial plants throughout the world depend on Clipper lacing equipment to help maintain a maximum of continuous production.

Clipper Hooks are actually 20 to 30% lower in price than other makes, yet are unsurpassed in quality and durability.

The Clipper No. 6 Speed Lacer, weighing only 56½ lbs., with a pressure of 37,500 lbs., is the last word in belt lacing speed and efficiency.

In exactly 90 seconds this remarkable machine will lace both ends of any belt up to six inches in width with uniform smoothness and precision.

Clipper Lacers are made in types to meet every shop requirement. With Clipper Hooks and Pins they ensure perfect, lasting joints.

For complete demonstration, communicate with your nearest dealer or with the

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

Clipper

GAS for Heat Wherever Heat is Needed

A battery of gas-fired batch-warmers, used to keep hard candy in a plastic condition for final operations.

WHAT HAS *Gas* TO DO WITH CANDY?

Gas has a great deal to do with candy. Gas heat insures correct temperature maintenance, without fluctuations. It builds up to maximum, drops to nothing instantly at the turn of a valve. Gas heat has a wide variety of uses in the process of making candy. Write for the new free book "Gas Heat in Industry".

AMERICAN *Gas* ASSOCIATION

420 Lexington Avenue, New York

HOW 50% STEAM AND POWER WERE SAVED IN DRYING ALMONDS

Product:

ALMONDS (without skin)

Difficulties:

Case Hardening.....
Cracking.....
Uneven Drying.....X
Spoilage.....X
Poor Product.....
Expense.....X
Long Cycle.....
Other Factors. *If under-dried, almonds stuck together; if over-dried, they were tasteless.*

Problem:

Temperature Permissible..150° F.
Limits of Temperature Control.....Thermostatic
Humidity Control.....None
Drying Day.....10 hours
Wet Weight.....1152 pounds
No. of Dryer loadings per day...2
Thickness of Material on Trays.....1 inch
How loaded.....Hand
Amount of moisture to be removed.....8.8%

Dryer Used:

One No. 200 Ejector Dryer. 2 trucks each holding 40 trays in 2 tiers 20 trays high, trays spaced on 3" centers. Tray size 36" x 36" x 1". Thermostatic control, Temperature 150° F. No humidity. Steam pressure 40 pounds.

Results:

Uniform product of high standard quality.

Cycles increased from one cycle per day of ten hours to two cycles (4 hours each) per day of 10 hours.

Saving of 50% in steam and power.

With 50% saving in steam and power and elimination of spoilage, system should pay for itself in less than 14 months.

EJECTOR DRYERS pay for themselves in 14 months

DRYING almonds is a typical and a markedly successful Ejector Dryer application. Actual results have proved that this dryer paid for itself within 14 months . . . and have made it stand out as the model machine in this particular plant.

The Ejector System requires only 1/3 to 1/5 of the total air volume of the drying room to bring *all* the air into vigorous, uniform circulation . . . and to quickly regulate the air to the desired temperature and humidity.

The elimination of leakage, bypassing and stratifying of the air is an exclusive feature which assures uniform circulation and velocity throughout the entire dryer. The use of blast fin heaters with the Ejector System makes possible simple and absolute control of temperature and humidity at all times.

Results are:

Even drying of all material no matter where the trays are placed in the dryer . . . and regardless of whether the dryer is practically empty or entirely filled with trucks.

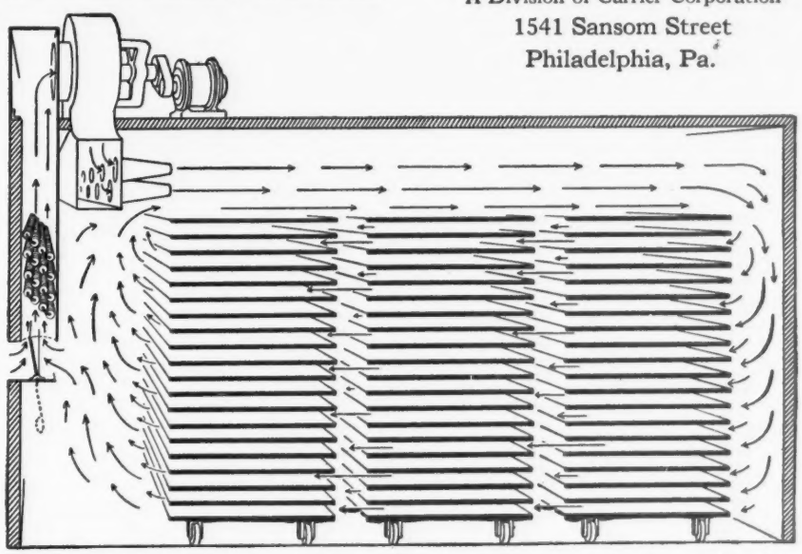
Definite, dependable drying cycle at all times.

Drying from the "inside out" . . . or, in other words, the elimination of case or surface hardening.

When desired, the Ejector Dryer may be built around existing trays, trucks or other machinery without affecting the efficiency of the dryer.

Our engineers will be glad to discuss the application of this system to your particular drying problems. It incurs no obligation on your part . . . and it might point the way to substantial operating economies or a worthwhile improvement in your product.

Carrier-York Corporation
A Division of Carrier Corporation
1541 Sansom Street
Philadelphia, Pa.



STANDARD CARRIER EJECTOR DRYER. Uniform air distribution assured throughout the entire dryer. Built in a range of standard sizes to meet all normal requirements.

Carrier Dryers

EJECTOR . . . GORDON

That's Dollars And "Sense" Talk

HACKNEY permanent steel barrels have long been famous for their seamless, leak-proof construction; their patented raised openings, which drain the contents to the last drop—or full removable heads, which make emptying and cleaning so easy; their ability to take hard knocks without denting — attractive appearance—and easy handling.

Those are advantages for which many companies would gladly pay a premium. But instead — Hackneys frequently save them more than 40% in their shipping costs.

Permanent containers, however, are not always the most economical. And Hackney sells thousands of dollars worth of single trip containers every year. *But the possible savings in using Hackney returnable steel barrels and drums are too great to pass up without an investigation.* Let us work with you in analyzing your shipping problems to see if permanent containers cannot lower your shipping costs.

A Few Prominent Hackney Users

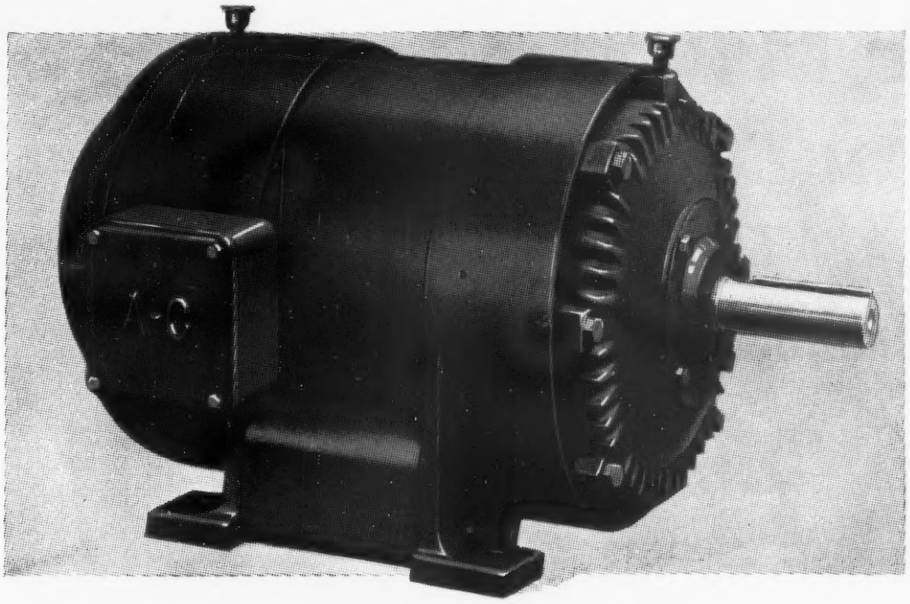
Grasselli Chemical • Pittsburgh Plate Glass • Procter & Gamble • C. & N. W. R. R. • Delco Light Co. • Southern Cotton Oil • White Eagle Oil Refg. Co. Paper Makers Chemical • Du Pont

PRESSED STEEL TANK COMPANY

1173 Continental Bank Bldg. . . . . Chicago
1349 Vanderbilt Concourse Bldg. . New York City
5771 Greenfield Avenue . . . Milwaukee, Wis.
477 Roosevelt Building . . . . . Los Angeles

Hackney
MILWAUKEE

Explosion Proof Motor



Approved . . . .

for use in

Hazardous Locations

Allis-Chalmers Motors

. . . . include the explosion proof type for Class I locations; enclosed fan-cooled types, approved by the Underwriters for Class II locations such as dusty atmospheres; general purpose, squirrel cage and slip-ring induction types; synchronous and direct current motors. Whatever the condition or type of drive, there is an Allis-Chalmers motor to fit it.

The Allis-Chalmers Explosion-proof Motor is approved for use in hazardous atmospheres, *Gasoline*, (*Pyroxylin Lacquer Vapor*) such as are encountered in oil refineries, gasoline plants, dry cleaning plants, paint, varnish and lacquer plants . . . and similar industries.

This motor is of the fan-cooled type, where a blast of cooling air is forced through an air jacket surrounding the motor. It is simple in construction, and all parts are readily accessible.

The use of extra long seals to prevent the escapement of flame and cool the gases below the point of ignition, together with unusual sturdiness to safely resist stresses due to possible internal explosions or flashes . . . make this the most practical explosion-proof motor ever developed.

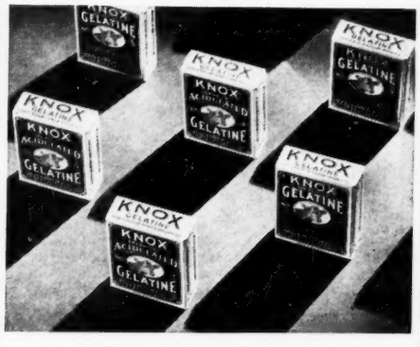
Send for descriptive leaflet 2125-A.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

To-morrow's
PROFITS
Must Come from
To-day's
Production Economies

Lamson Conveyors take filled cartons to the sealing machine where they discharge to a spiral chute which conveys them to stock.



Production machines are linked by Lamson Conveyors for smooth, economical manufacturing.

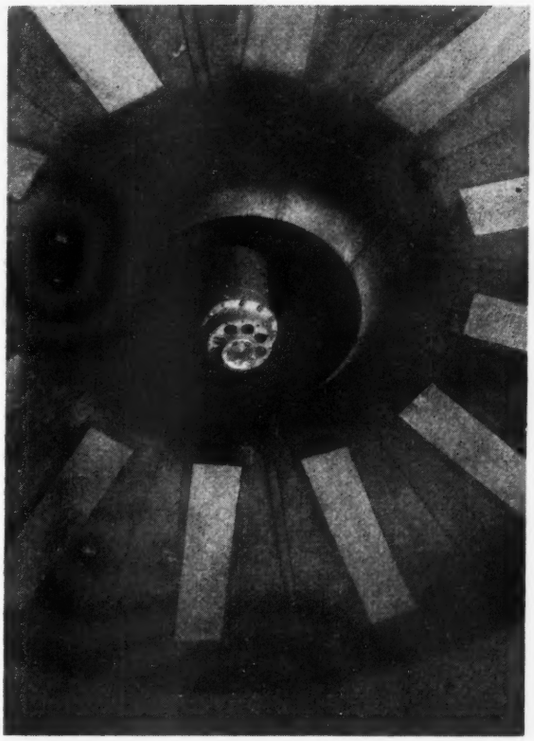
TO-DAY, more than ever before, sales depend on price —and profit depends on production economies.

Food manufacturers will find much of value in the production methods of the Charles B. Knox Gelatine Company, Inc., Jamestown, N. Y. Here, Lamson conveyors have so coordinated every step in the manufacturing process that the product literally flows from raw material to storage or freight car in a smooth, steady stream. Costs have been cut; bottle necks, where work piles up, are eliminated; men and machines are kept uniformly busy; waste floor space is reclaimed for productive work; and storage and shipment have become almost automatic.

The Lamson man has two things to offer you: (1) a greater profit from your present volume, and (2) a more efficient production line to take care of increases in volume with no increase in floor space or production equipment. Through him, Lamson's 50 years of experience in solving materials-handling problems are available to you. He will be glad to work with your plant engineers and executives in uncovering the potential savings in your production line. This service is without cost. Address: The Lamson Company, Inc., Syracuse, New York.

LAMSON
CONVEYORS

Unit Spray-Drying



Take an old product and make it new by Unit Spray-Drying. You can do this easily and at moderate first cost. Your initial capital risk will not be great and your equipment can grow with the market for your product . . . *Now a New Product with a New Market.*

High speed, motor driven disc atomizers are used in our Unit Spray Driers. These atomizers are simple, have a long life, and will atomize anything that can be pumped through an 1½" pipe. Sludges, slurries, solutions, suspensions . . . are all alike to these atomizers. Fibres make no difference either. A valuable *New Product* awaits you.

We will gladly furnish additional information about UNIT SPRAY DRIERS if you will write us.

UNIT SPRAY DRIERS
TYPE A $7500
F. O. B. Garwood, N. J.

BOWEN RESEARCH CORPORATION,
117 LIBERTY STREET, NEW YORK

NEW METHODS

for Cooling the Air for Comfort . . . Cold Storage . . . Industrial Processes

COOLING by refrigeration is not new. But now, almost every day sees some profitable new use made of it, made possible by the new Niagara Standard Air Conditioners and Fan Cooling Units.

By originating these standard machines, this company has greatly widened the application of air conditioning; even more, has created new economies and more effective methods in the older applications of refrigeration, such as cold storage, creameries and other food industries.

Air Conditioning means creating the most favorable climatic conditions in any space. It consists of six distinct operations; heating or cooling, moistening or drying the air, purifying it and circulating it.

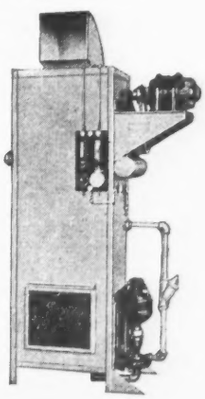
Standard Niagara Air Conditioners perform all these operations automatically as required for holding a precise result. If only a part of them is needed, there is a scientifically made Niagara unit for that special task.

If you have a business building that needs better air for human comfort or efficiency, or an industrial problem relating to cooling, heating, handling of hygroscopic materials, or to the use of air in motion, we invite you to consult our engineers.

NIAGARA BLOWER COMPANY
General Sales Office
6 E. 45th St., New York City
Buffalo, Philadelphia, Pittsburgh, Boston, Cleveland, Detroit, Montgomery, Ala.

Air Conditioners, Aluminum Heater Coils, Fan Heaters, Fan Coolers, Cooling Surface.

Systems for Cooling, Humidifying, Drying, Solvent Recovery, Dust Recovery, Pneumatic Conveying.



NIAGARA BLOWER COMPANY BUFFALO, N.Y.
NIAGARA

SECOND EDITION OF

The VITAMINS

■ H. C. Sherman
■ S. L. Smith

A. C. S. MONOGRAPH — ENTIRELY REWRITTEN

KNOWLEDGE of the vitamins has grown so greatly during the past few years that there is today a very great need for a new book on the subject.

This monograph has now been entirely rewritten and brought down to date, with the intention of making it distinctly the outstanding book in its field.

It undertakes to treat its field both broadly and thoroughly, each of the six vitamins now generally recognized being discussed in its various aspects—the physical properties, the evidence as to purely chemical nature, the biological relationships and occurrence in nature, the methods of determination, the distribution in foods, and the significance as a factor in food values and in relation to nutrition and health.

In addition to this broadly inclusive text, the book contains an extraordinarily comprehensive bibliography arranged and set up in a manner which makes it exceedingly easy and practical to use.

The volume is thus designed to serve agriculturists, biologists, chemists, dieticians, food manufacturers and their technologists, home economics and nutrition workers, physicians, teachers, and many other readers interested in the present-day development of science and in the problems of food and health. To many students in this varied field, the bibliography alone may well be worth the price of the book.

525 PAGES • ILLUSTRATED • PRICE $6.00 • *Detailed description sent on request*

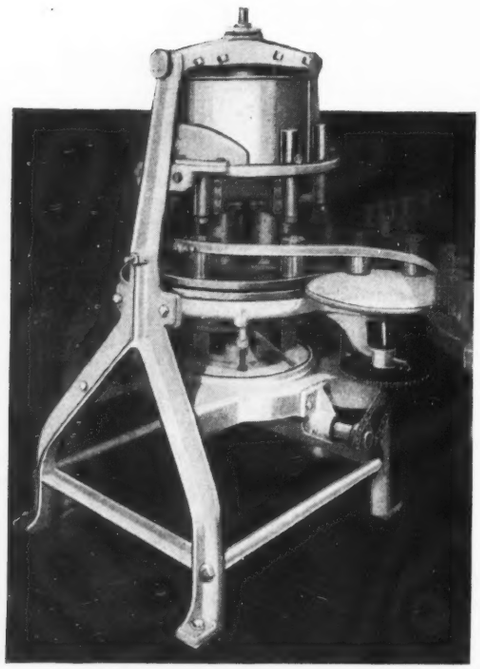
The Chemical Catalog Company, Inc.
419 FOURTH AVENUE, NEW YORK, U. S. A.

"But my filling problem is different"

That's what cheese packers, manufacturers of malt, lard, crisco babyfood, oils and other products said when we told them they needed an M&S Filler. But M&S Fillers are now filling their products uniformly, quickly and cheaply.

M&S FILLER

FILLS ALL MOIST OR VISCID PRODUCTS



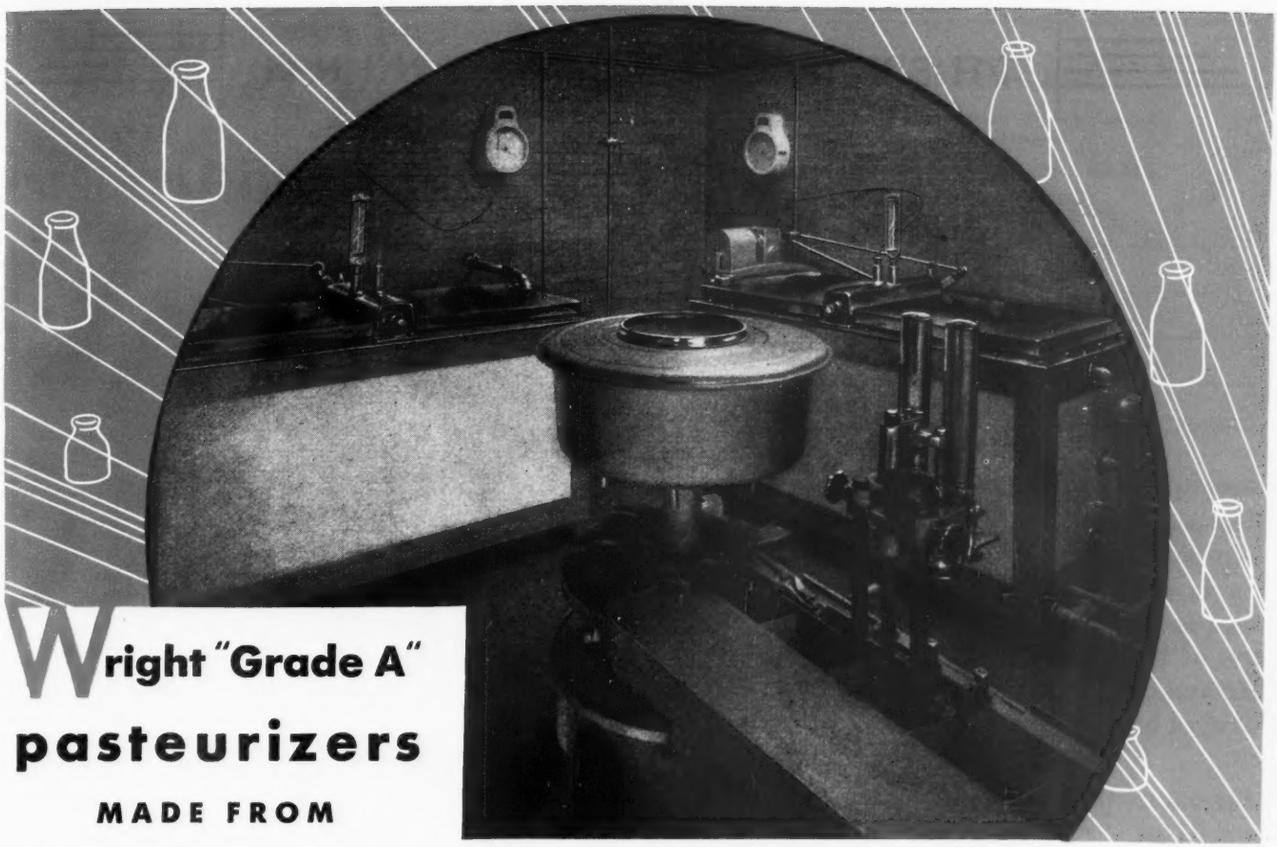
The M&S is the universal filler. It fills any liquid, semi-liquid, viscous, mushy, or semi-solid mixture or material into tin, glass or paper containers,—round, square, oval, flat—small mouth or large. The same piston-forced, positively-measured feed that has made the M&S the standard filler in 600 corn canneries is the reason for its success in filling common and unusual substances in all branches of the food industry. Speed? Depending on product and container, the M&S is filling at speeds of from 90 to 200 per minute. A new model just introduced, the M&S Hi-Speed, fills small cans at 300 per minute! Cost? Special-design efficiency at mass-production price.

Our engineers have had long experience in overcoming just such difficult filling problems as yours. Their services might put money in your pocket. Write today describing your product and container. No obligation.

SOME USES AND USERS

Products		Users
Crushed Corn	Fruitcake	National Biscuit Co.
Pumpkin	Shortening	General Seafoods Corp.
Applesauce	Mincemeat	Cudahy Packing Co.
Condensed Milk	Chocolate Syrup	Crosse & Blackwell
Malt Syrup	Lard	Campfire Co.
Tomato Paste	Jelly	Rainier Brewing Co.
Dogfood	Jam	Procter & Gamble Co.
Soup	Relish	American Diamalt Co.
Potted Meat	Salad Oil	Chappel Bros.
Cheese	Syrup	Wm. Underwood Co.
Fishcakes	Ice Cream	Fremont Canning Co.
Marshmallow	Plum Pudding	Hershey Chocolate Co.
Chili Con Carne	Grated Pineapple	College Inn Products Co.
Babyfood	Welsh Rarebit	Swift & Co.

SPRAGUE-SELLS CORPORATION
Division of Food Machinery Corporation
306 W. WASHINGTON ST., CHICAGO, ILLINOIS



Wright "Grade A" pasteurizers MADE FROM ENDURO STAINLESS . . . . the SAFE metal

LEADING manufacturers of food processing equipment now agree that wherever food products must come in contact with metal, the metal should be ENDURO, the perfected stainless steel. • Illustrated are two Wright "grade A" pasteurizers, recently installed in a prominent eastern dairy, which are fabricated from this *safe* metal by R. G. Wright & Co. of Buffalo. • ENDURO is invariably selected for dairy and food plant equipment because ENDURO is stainless and non-contaminating in every service. It can never affect the taste, or color, of any food product. And it retains its lustrous, easily cleanable surface for the life of the equipment. • You'll find that it will pay you to insist that your next equipment be made from this sanitary, stain-free and permanent metal. Investigate the matter now. Let us send you full particulars, together with a list of equipment manufacturers now fabricating from ENDURO.

ENDURO
REPUBLIC'S
PERFECTED STAINLESS STEEL

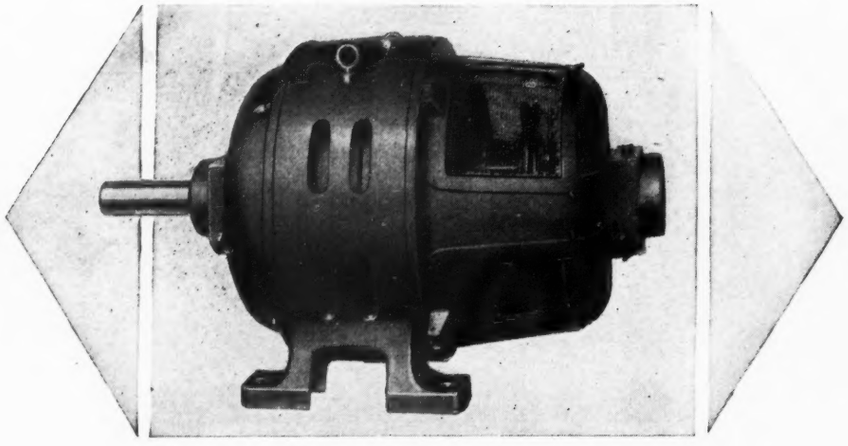
Enduro KA2 is sold only through Republic Sales Offices and authorized distributors.

CENTRAL ALLOY DIVISION
REPUBLIC STEEL CORPORATION
Massillon, Ohio

ENDURO

Manufactured under license from Chemical Foundation, Inc., under basic patents No. 1316817 and No. 1339378.

THEY KEEP A-RUNNING



10 Horse Power Century Type SR Slip Ring Induction 3 and 2 Phase Motors

FOR STARTING EXCEPTIONALLY HEAVY LOADS

Wherever a motor is subjected to exceptionally severe starting conditions or where speed reduction is desirable, the use of Century Type SR Slip Ring Induction 3 and 2 Phase Motors is particularly recommended . . .When equipped with speed control, the speed can be varied down to one half the normal of maximum speed rating.

These motors are well-balanced in design—no one characteristic is over-developed at the expense of another ...The shafts are generously proportioned and ground overall and polished on the bearing surfaces...The bearings last—they are made from phosphor bronze castings ...Protective enclosing covers can be furnished in screened, gridded, drip-proof, fully-enclosed or dust-proof types.

Built in standard sizes from ¼ horse power.

CENTURY ELECTRIC COMPANY
1806 PINE ST. • • ST. LOUIS, MO.
40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof

SINGLE PHASE, THREE PHASE, AND DIRECT CURRENT MOTORS

Century MOTORS

MOTOR GENERATOR SETS, ROTARY CONVERTORS, FANS AND VENTILATORS

SR-I-10

FOR MORE THAN 27 YEARS AT ST. LOUIS

Inviting You to a **cost-cutting conference**

HARNISCHFEGER CORPORATION
4507 W. National Avenue, Milwaukee, Wisconsin

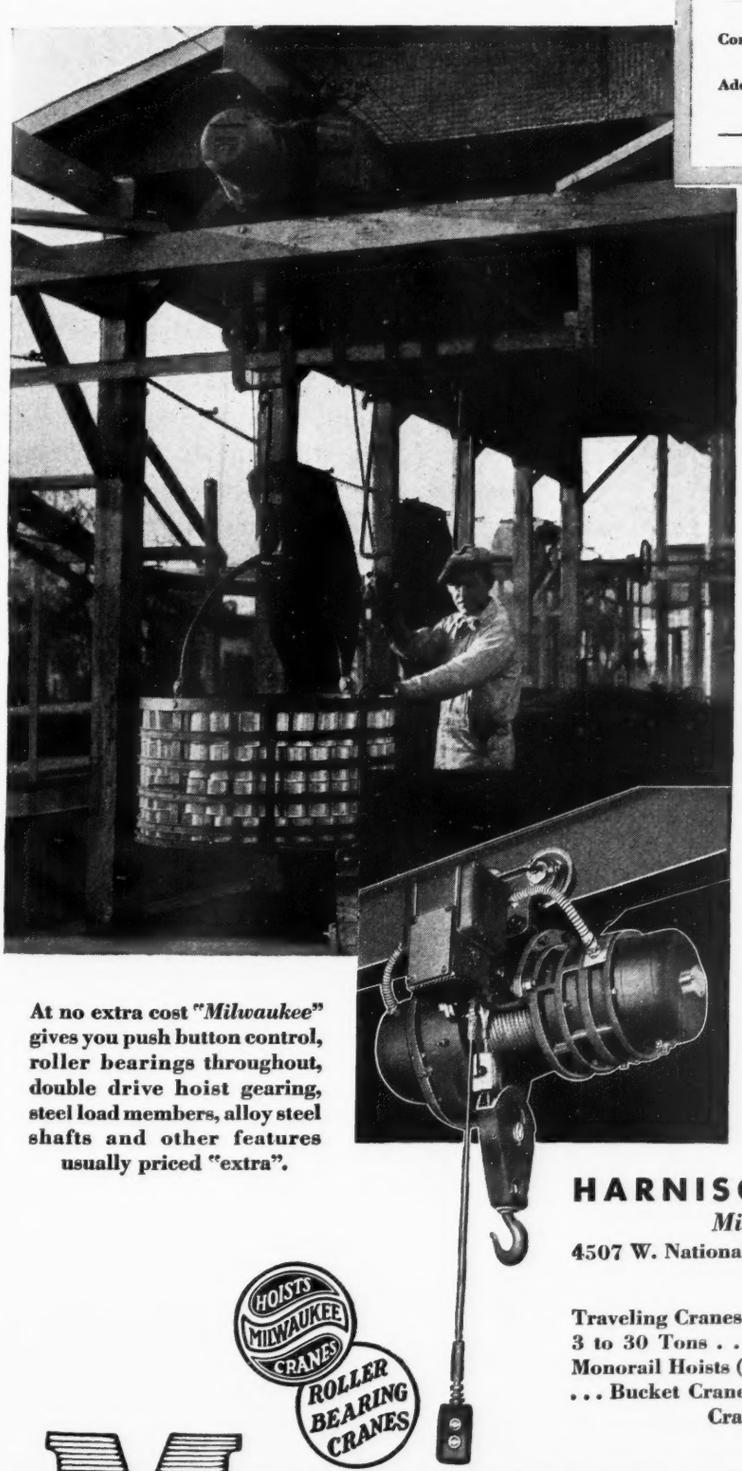
☐ Show me how "Milwaukee" Electric Hoists give us greatest value for our money.

☐ Show me how "Milwaukee" Hoists will help us to cut costs.

Name_____

Company_____

Address_____



At no extra cost "*Milwaukee*" gives you push button control, roller bearings throughout, double drive hoist gearing, steel load members, alloy steel shafts and other features usually priced "extra".

A "show me" meeting, if you please.

For if you are *buying* hoists, you will want to see the outstanding features that "*Milwaukee*" gives you at no extra cost . . . And if you are not now using hoists, you will be glad to see how these moderately priced material movers cut handling costs and help to increase profits!

Traveling on an overhead monorail, these small hoists handle ¼ to 10-ton loads speedily and safely. Used with a traveling I-beam bridge, you have an inexpensive overhead crane of 5 tons capacity.

You will find these hoists the most useful equipment in your shop, shipping department or yard. They require only a small investment . . . and pay for themselves quickly.

They are available in seven styles of mounting for every possible use.

Dependable operation is built into "*Milwaukee*" Hoists by P & H, world's largest builder of cranes and hoists.

Fill in the "show me" invitation. Why not take a minute *now* . . . mail it today?

HARNISCHFEGER CORPORATION
Milwaukee Crane & Hoist Division
4507 W. National Avenue **Milwaukee, Wisconsin**

▲ ▲ ▲

Traveling Cranes up to 300 Tons . . . Low Headroom Cranes 3 to 30 Tons . . . Single I-Beam Cranes ¼ to 5 Tons . . . Monorail Hoists (all types) ¼ to 10 Tons . . . Lumber Cranes . . . Bucket Cranes . . . Corduroy-Crawler Cranes . . . Gantry Cranes . . . Single Line Buckets.

HOISTS MILWAUKEE CRANES ROLLER BEARING CRANES

MILWAUKEE

It's up to YOU..

YOU GET PAYING RESULTS WITH "UNIQUE" MIXERS

Do you want to save minutes per batch—and dollars per minute in mixing?

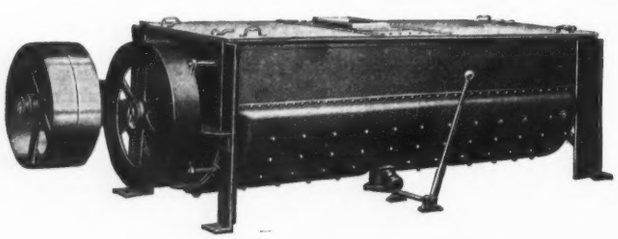
YOU CAN

There are three "times" to be figured when computing mixing costs:—the time necessary to load and discharge; time required for a thorough mix; and time out for cleaning and repairs. Unnecessary time eats into overhead and production costs—so, by building Unique Mixers to reduce time on all operations to the absolute minimum, *you* save the difference.

Then consider that, for the same capacity, Unique Mixers consume from 15% to 30% less power than other models—you have almost the whole story. To get the rest you will have to see the improvement in your product. It's up to you. Think it over.

ROBINSON MFG. CO.

71 PAINTER ST., MUNCY, PA.



Steam-Jacketed Mixer with Half Jacket
Also Furnished with Full Jacket

UNIQUE

CRUSHERS GRINDERS
MIXERS SIFTERS
ELEVATORS CONVEYORS
BINS HOPPERS TANKS

USS Chromium-Nickel Alloy Steels are produced under licenses of the Chemical Foundation, Inc., New York; and Fried. Krupp A. G. of Germany.

A MARK OF CHARACTER *for* STAINLESS AND HEAT RESISTING ALLOY STEELS

USS

Five of the subsidiary manufacturing companies of the United States Steel Corporation are specializing in the manufacture of high grade Chromium and Chromium-Nickel Alloy Steel products. Communicate with these companies, as listed on the next page, relative to your requirements.

USS

USS STAINLESS AND HEAT RESISTING ALLOY STEELS

CHROMIUM-ALLOY STEELS *Ferritic*	CHROMIUM-NICKEL STEELS *Austenitic*
USS 12	USS 18-8
USS 17	USS 18-12
USS 27	USS 25-12

Typical Uses:

¶ **AUTOMOTIVE and AERONAUTIC**—For radiator shells, hub caps, lamps, bumpers, moldings, polished parts and fittings, hardware and trim, airplane parts and instruments.

¶ **MANUFACTURING and INDUSTRIAL**—Machinery and furnace parts, dampers, fans, preheaters, pumps, conveyors, turbine blades, nozzles, plungers, and machinery specialties.

¶ **CHEMICAL**—Vats, tanks, stills, digesters, condensers, retorts, paper and pulp manufacturing equipment, circulation systems, and laboratory apparatus.

¶ **OIL REFINING**—Bubble caps, still tubes, linings, heat exchangers, ducts, containers, tanks, agitators, and other refining equipment.

¶ **FOOD HANDLING**—Pasteurizers, tables, hospital and hotel kitchen equipment, restaurant fixtures, cafeteria trays, food preserving and dairy machinery and accessories, ice cream and milk containers and utensils.

¶ **ARCHITECTURAL**—Structural members and supports, hinges and hardware, decorative metal embellishments, flat surface facings, moldings, doors, grilles, panels, and ornamental work.

¶ **HOME APPLIANCES**—Kitchen equipment, cooking and canning utensils, furniture, cabinets, electrical appliances, sinks, plumbing fittings, stoves, ranges, and tableware.

¶ **MISCELLANEOUS**—Packing house equipment, soda fountain counters and fixtures, display cases, humidors, handles, hooks, trays, golf clubs, skates, switch boards, metallic mirrors, laundry machinery, tank cars, railway car parts and fittings, and many other uses where beauty and resistance to corrosion are important factors.

Manufactured by the following Subsidiary Companies of the United States Steel Corporation:

American Sheet and Tin Plate Company
Pittsburgh
Steel Sheets and Light Plates

American Steel & Wire Company, Chicago
Cold Rolled Strip Steel, Wire and Wire Products

Carnegie Steel Company, Pittsburgh, and Illinois Steel Company, Chicago
Bars, Plates, Shapes, Special Sections and Semi-Finished Products

National Tube Company, Pittsburgh
Pipe and Tubular Products

Pacific Coast Distributors: COLUMBIA STEEL COMPANY, San Francisco
Export Distributors: U. S. STEEL PRODUCTS COMPANY, New York City

These stainless and low carbon steels, in a series of appropriate compositions, are a distinct contribution to the requirements of modern arts and industries. To their development and production the subsidiary companies have applied vast resources of equipment, organization, and research, aided by the scientific investigations of the Department of Research and Technology of the Corporation. Furthermore, by direct arrangement with Fried. Krupp A. G. of Germany, the processes and patents controlled by that firm have been made available.

Buyers and users of Chromium and Chromium-Nickel Alloy Steel products are invited to discuss their requirements with the subsidiary companies mentioned above. An interesting booklet describing U S S Alloy Steels will be sent upon request.

A CLEAN Pump

Cleanliness and sanitation are essential qualities in a pump for service in the food industries. These qualities are embodied in PERFECTION Rotary Pumps.

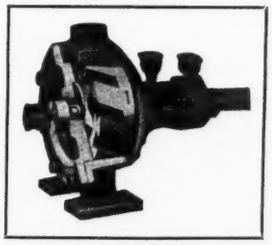
Perfection Pumps are clean pumps and easy to keep clean. They are highly finished inside and built to be easily accessible.

Their positive action, their steady pulsationless flow, free from excessive churning, are features of special merit in handling liquid food products. Milk, cream, water, brine, molasses—scores of such products are pumped by the Perfection.

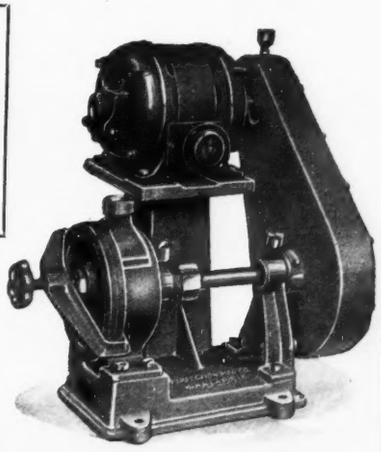
Helical gears are the outstanding features in the Perfection Pump. The teeth of the helical gears shear through the liquid on an angle instead of splashing through head on. The adaptation of the helical gear principle provides a smooth, continuous flow of liquid and eliminates excessive churning.

Your plant too is entitled to this efficiency in your pumping equipment. Write for details regarding the perfected Perfection Pump.

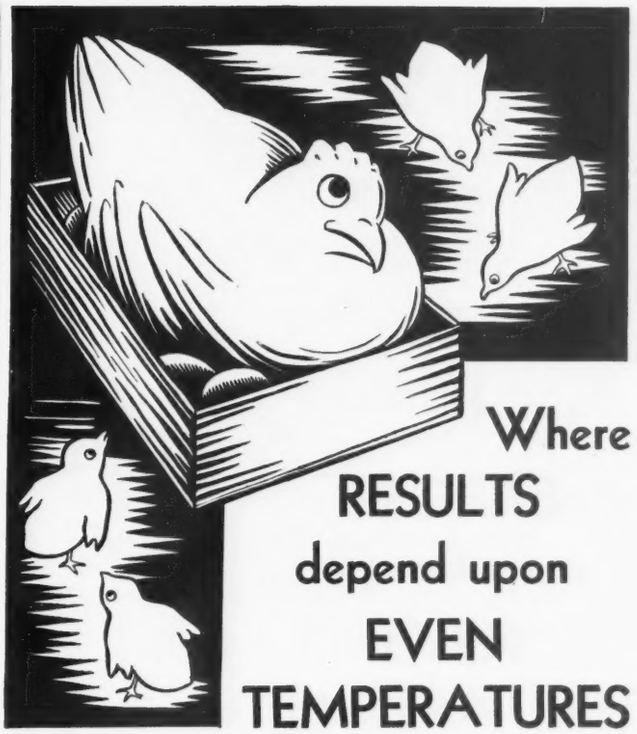
Perfection Manufacturing Co.
2186 East Hennepin Ave., Minneapolis, Minn.



Above is shown cutaway section disclosing the Helical cut gears, an exclusive feature.



PERFECTION ROTARY PUMPS



Where RESULTS depend upon EVEN TEMPERATURES

Have you ever wondered why others can undersell you? You may find the reason by looking at your method of regulating temperatures.

A batch of goods ruined now and then by too much or too little heat—a high payroll because men do work that Sarco Automatic Temperature Regulators could do more accurately and more cheaply—customers lost because goods do not come up to the standard on account of wrong temperatures used in the manufacture—production slowed up by goods being left in the heat-treating process longer than necessary—these are some of the things that boost costs and cut profits. And these are things which Sarco Temperature Regulators remedy.

Let one of our engineers look into your temperature regulating problems and tell you what improvements he can suggest, if any. There'll be no charge for the service.

Write for a copy of our interesting Booklet AE-70, or mail the coupon.

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183 Madison Ave., New York, N. Y.

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SARCO TEMPERATURE REGULATOR

SARCO CO., Inc.
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Without obligation on our part, you may
☐ Send a copy of Booklet AE-70.
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NEW *the latest stock drive book*

FREE This handy book contains all of the information needed to order any stock Morse Chain drive up to 50 H. P. You will find it a very useful source of information. Complete prices are given. Secure your copy for immediate or future use now—simply fill in and mail the coupon below to

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Manufacturers of Morse Chain Drives
Flexible Couplings, and Speed Reducers

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F.I. June—1931

SANITARY conditions must prevail where foods are handled, if contamination is to be avoided and quality maintained.

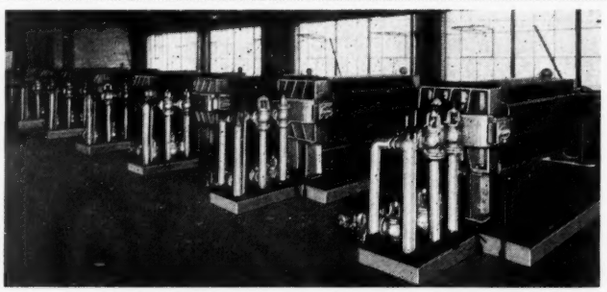
But doing this need not be expensive or take a lot of time. Food plants everywhere are discovering that Oakite is the ideal material for keeping floors, tables, walls, and equipment clean without laborious scrubbing. An ounce to the pail of water does most jobs. Time and money are saved.

for low-cost plant sanitation

A postal to us brings more details about other food plant cleaning operations. No obligation.

Manufactured only by
OAKITE PRODUCTS, INC.,
26G Thames St., New York, N. Y.

OAKITE
Industrial Cleaning Materials and Methods



SHRIVER FILTER PRESSES
Filter Crisco

Crisco, the right cooking arm of the housewives, the chefs and the cooks of the world, is another famous food product, filtered during processing with Shriver Filter Presses. Many prominent food firms are using Shriver Filter Presses to their profit.

Your Inquiries are Solicited

T. SHRIVER & COMPANY
Established 1860
860 Hamilton Street Harrison, N. J.

A Filter Press For Every Purpose

SHRIVER

Filter Presses Filter Cloth Diaphragm Pumps

BROMO SELTZER Kept Pure by American Air Filters

Bromo Seltzer is assured of the two first requisites of a food or drug—a clean product and a sanitary package. The air that comes in contact with Bromo Seltzer is cleaned by American Air Filters. The bottles it is put up in are dried in filtered air.

That is the way the Emerson Drug Company insures an absolutely pure, clean product—one that builds prestige year after year.

In the drying ovens of the Bromo Seltzer laboratories, is a 12-unit battery of American Air Filters of the unit type, protecting the proportioned and mixed ingredients of Bromo Seltzer from the dust contamination that otherwise would result from the air drawn into the dryers. This battery has an air filtering capacity of 7,200 c. f. m.

After the bottles are washed in water at a temperature of 200°F., they are dried in an oven to which an average of 4,800 c.f.m. of filtered air is supplied by a 9-unit battery of American Air Filters, assuring absolute cleanliness of finished product when received by the consumer.

HOW STEALTHILY

DUST GETS A FINGER IN YOUR PIE

MIDWEST TRADE MARK Reed Air TRADE MARK filters ALL METAL NATIONAL AIR FILTERS TRADE MARK

The products formerly manufactured under the above trade marks are now combined in:

AMERICAN AIR FILTERS

No matter what your particular "pie", dust loves to get his finger under the crust. Furtively he creeps into your building, your product, your machinery, your school, your employee efficiency, as quietly as he might slip in the kitchen window on the rays of the sun and settle unnoticed into an actual pie sitting on the table. You open your pie and there he is. For instance:

STEEL MILL *Saves $35,000.* Dust deposits in the generator ducts and windings made it unsafe to operate the turbo-alternators in a large steel mill at more than 85% of their rating. After installing air filters, continuous operation under full load became possible giving additional capacity worth $35,475 a year.

A SCHOOL *Decreases Absenteeism.* A school installed a new ventilating system, including air filters, and reduced absenteeism 13.8%.

MANUFACTURER *Prevents Contamination.* A large gelatine manufacturer says, "It is doubtful whether we could have maintained our present volume of business if we had continued to use unfiltered air. Whereas we had little control over contamination, we can now assure users of a uniformly clean gelatine."

Now, or before you know it, dust may have a finger in your pie. Air filters that pay for themselves in an average of three years or less will prevent the intrusion of dust at once and permanently. Send the coupon for details. No obligation. AMERICAN AIR FILTER COMPANY, Louisville, Ky., and Bradford, Pa.

American Air Filter Co., *Incorporated,* 117 Central Ave., Louisville, Ky.
Please send literature on the uses of modern air filters.
Use in which interested_____
Name_____
Street_____
City_____ State_____

BETTER FLOORS

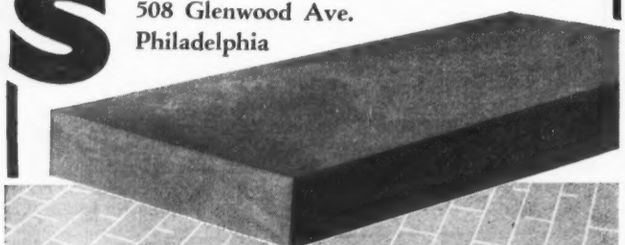
can be laid
RIGHT OVER
OLD FLOORS

Another of the many advantages DURATYLE offers to the meat packer and sausage manufacturer—it can be laid right over the old floor. No department tie ups. The average sized job can be installed over-night. A blessing to the busy packer who needs his plant facilities and BETTER FLOORS at the same time.

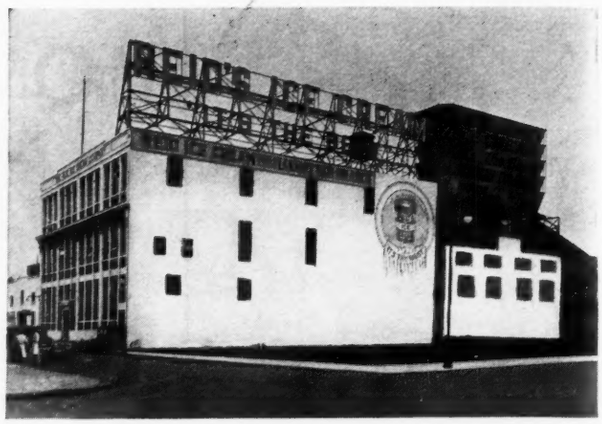
Our organization is equipped to handle the entire job, including installation. With this service goes a guarantee —a guarantee to provide floors that look better, last longer, and "lick" your floor problems. Could you ask more?

Write today for description and details.

DREHMANN
Paving & Construction Co.
508 Glenwood Ave.
Philadelphia



DURATYLE



STEP UP PRODUCTION
with a Paint Brush!

TO "Save the Surface" is important, certainly—but that is only one of the savings proper painting will effect in your plant.

Paint protects. Paint beautifies. Paint makes your plant easy to clean—and keep clean. Beyond all this, the magic flick of a paint brush will transform a dark, dismal room into a clean, pleasant place in which to work. It will cut down your lighting bills. It will reduce eye-strain and speed up production.

Newlite Interior White is the *whitest* interior paint on the market. It diffuses reflected light without glare. The extra service it gives leads to real savings.

Among the CE-CO Technical Paints of special value in the Food Industry are: Newlite Fume Resisting White, Newlite Heat Resisting White, Newlite Damp Resisting Flat White, Newlite One Coat White, Sheen Finish, Bituseal Interior Undercoat, CE-CO Dado Enamel, CE-CO Engine Enamel, CE-CO Pipe Enamel, CE-CO Cement Floor Enamel, Cecoloid Enamel and numerous others.

The long service life of these CE-CO paints specially adapted for your industry and intelligently specified for your plant, brings a new conception of true paint economy.

Write today for helpful Bulletins covering the paints in which you are interested. It entails no obligation.

Cheesman-Elliot Co., Inc.
Established 1876
Technical Paint Makers
639-647 Kent Avenue Brooklyn, N. Y.

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WORTHINGTON

TRADE MARK

PUMPS

Worthington builds complete lines of pumps for handling fluids at all practicable ranges of temperature and pressure; air, liquids and semi-liquids, clear, gritty, acid, alkaline or neutral in character.

These lines of pumps include the following types:

Steam Pumps—Direct-acting and flywheel reciprocating pumps—horizontal and vertical; simplex and duplex; piston and plunger; simple, compound and triple expansion; condensing and non-condensing, in all sizes and types to meet every service requirement.

Centrifugal Pumps—Horizontal and vertical; single and multiple stage; types for ordinary contractors' needs and high efficiency pumps for the most exacting service. Built in special metals for special purposes, for belt, motor or engine drive. Worthington specializes in centrifugal pumps and offers machines capable of meeting the most unusual requirements through wide ranges of conditions. Low pressure large volume service for capacities as great as 250,000 gal. per minute and multi-stage pressure pumps capable of working against pressures as high as 1600 lb. per sq.in.

Power Pumps—Horizontal and vertical; single, duplex and triplex; piston and plunger; for belt, gear, motor or engine drive. A wide range of sizes and types for all kinds of service.

Rotary Pumps—Types for handling light or heavy, non-abrasive and non-corrosive liquids having either lubricating or non-lubricating qualities. Positive displacement. For belt drive or direct connection to motor.

Deep Well Pumps—Rotating shaft types; Axiflo, Hiflo and Coniflo pumps with electric motor, belt, gear or steam turbine drive. These pumps, respectively suitable for depths of 200, 300 and 400 ft. or less, have characteristics which enable them to do work within their scope second to no other type of pump built for such service.

Reciprocating types; single and double-acting single plunger and single-acting two and three plunger pumps.

Sump Pumps—Axiflo and centrifugal types for intermittently draining tanks, pits, etc.

GAS ENGINES

Horizontal four-cycle double-acting type; for natural or blast furnace gas; for power and for gas compressor service in sizes ranging from 160 hp. to 5000 hp.

DIESEL ENGINES

Vertical types for direct power or generator service—stationary and marine service.

Single-acting—two-cycle, solid injection; four-cycle, air or direct injection.

Double-acting—two-cycle, air injection.

Ranges of power through various types from 50 hp. to 12,000 hp.

FEATHER VALVE COMPRESSORS

Horizontal and vertical; single and duplex; one, two, three and four stage; steam, Diesel engine, belt or direct-connected-motor drive; for air, gas, or ammonia service; used with Worthington-Harris air lift and for gas lift. Built in sizes and capacities to meet the entire range of industrial requirements.

STEAM CONDENSERS

Surface, barometric and jet condensers of varied types and sizes, in ranges of capacity from the small power plant to the largest public service central power station requirements. Worthington also builds complete systems, including condenser auxiliaries, vacuum pumps, steam-air ejectors, etc.

METERS

For cold or hot water, boiler feedwater, cold or hot oil, gasoline, etc. Built in disc, turbine-velocity, compound and piston displacement types in ranges of size to meet practically all industrial requirements.

FEEDWATER HEATERS

Stationary—Open type. Water is heated by direct contact with steam, assuring maximum heating and highest temperature with least waste. Water is purified and gases eliminated. Pronounced saving in water and coal.

Locomotive—Open type. The most effective means of heating feedwater for locomotive use. Average results show that these heaters remove 80% corrosive oxygen from the water and effect savings of 12% in fuel and 14% in water.

ROCK DRILLING EQUIPMENT

The Worthington-Gilman products comprise rock hammers for hand drilling rock, shaft sinking, etc.; auger drills for coal mining; drifters for tunnel and mine opening and development works; forging furnaces and automatic heat treating machines for drill steel; drill steel, hose and other accessories. A wide range of sizes to meet every drilling need.

MULTI-V-DRIVES

A combined Worthington and Goodyear development. Specially rubberized V-shaped cord belts running in grooved pulleys with a wedging contact, making possible short center drives with practically 100% efficiency. Transmission clean, quiet and without slip. Applicable in all cases where the grooved type of belting transmission can be used.

CHROMIUM PLATING

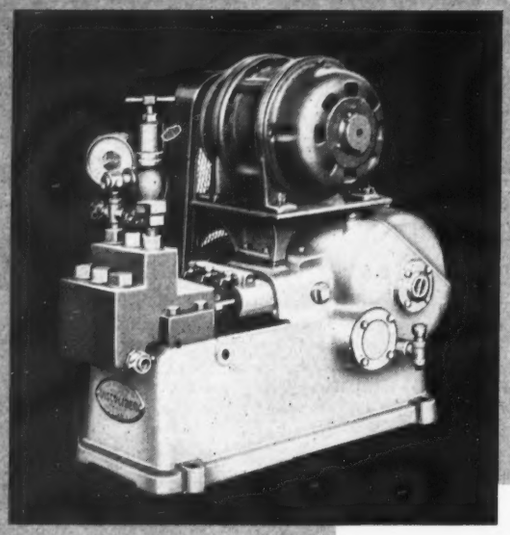
For machinery parts, such as rolls, platens, piston rods, driving shafts, valves, etc., where resistance to wear, abrasion, corrosion or high temperature is important, or where low coefficient of friction is desired, Worthington is fully equipped for the highly skilled treatment necessary for this class of plating, and invites correspondence on requirements.

INQUIRIES

Worthington invites inquiries on any of the above products, and will promptly forward literature covering the subject in detail. Address the nearest district office or representative.

G-61

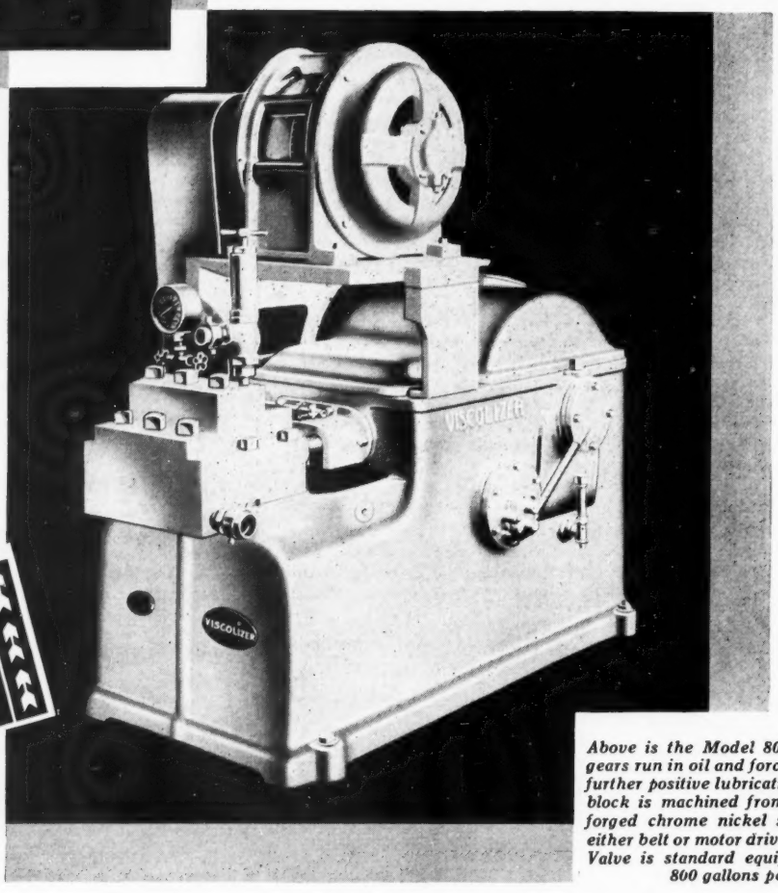
PREVENT SEPARATION WITH THE VISCOLIZER



VISCOLIZING tomato juice, catsup, mayonnaise, ice cream mix, salad dressings of many kinds, flavoring extracts, sweet cream and similar food products heightens their deliciousness, improves their appearance. "Separation" is prevented, texture is smoother, better. So we find the *Viscolizer,* long standard in the dairy industry, being used in increasingly greater numbers in various branches of the food industries.

Dependable in performance and low in operating costs, the *Viscolizer* is available in 7 models and sizes—capacities from 50 to 1000 gallons per hour. Our engineers will be glad to study your problems and submit recommendations without obligation to you.

Above is the Model 125 Viscolizer. All gears run in oil and the cylinder block is now solid cast bronze of the step valve type. Capacity 125 gallons per hour. Furnished either belt or motor drive. The Duo-Visco Valve is standard equipment.



"COORDINATED EQUIPMENT" by CHERRY-BURRELL

Above is the Model 800 Viscolizer. All gears run in oil and force feed pump adds further positive lubrication. The cylinder block is machined from a solid cube of forged chrome nickel steel. Furnished either belt or motor drive. The Duo-Visco Valve is standard equipment. Capacity 800 gallons per hour.

CHERRY-BURRELL CORPORATION

427 W. RANDOLPH ST., CHICAGO

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Export Office: 31 Union Square, New York City

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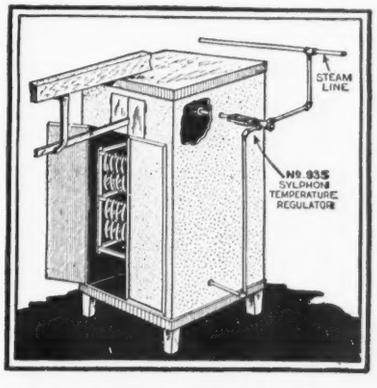
WRITE TODAY FOR VISCOLIZER BULLETIN No. G-155

POSITIVE CONTROL OF STEAM TO SAUSAGE COOKERS

A uniform cooking temperature in the sausage and ham cookers is essential for consistent quality in your products. Partially cooked meats, shrinkage and waste of labor are results of improper temperature regulation. At a surprisingly low cost you can eliminate the unreliable hand control of the steam supply, speed up production, save steam, and above all, produce a thoroughly cooked product that is presentable and acceptable to the market and much more profitably produced.

Sylphon Automatic Temperature Regulators are extensively used in the packing industry. The No. 935 regulator illustrated is especially suitable for sausage cookers. It is not a new device, but one that is daily demonstrating its accurate and dependable qualities. Easily installed, trouble free and will give many years of faithful automatic regulation.



WRITE FOR COMPLETE DESCRIPTIVE LITERATURE

Ask for a copy of bulletin LG-175. You will find this piece of literature valuable to you in many ways. Not only does it describe temperature regulation in the packing industry, but illustrates applications of temperature control in many other departments of the food industry. No obligations incurred by writing for a copy—it will be a pleasure to serve you.

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THE title (above) of the brand new TAG Canning Catalog speaks for itself. Everything is in it that you should know about the safeguarding of your pack by temperature and pressure indicating, controlling and recording instruments.
Your cookers, TAG equipped, as described in this catalog are served with the touch of a wizard. Send for your copy of Catalog No. 440-2.
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REGISTERED

—A sure-killing fumigant for elimination of bugs, weevil, mites, moths and rodents.

Larvacide penetrates into cracks, crevices and packing cases. Its safety feature for humans rests in its self-announcing characteristic.

Your own men can use it or our service men will take care of your fumigation requirements.

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NOTE

Copies of the May "Refrigeration and Quick Freezing" Number of FOOD INDUSTRIES are *no longer available.*

Due to an unprecedented demand the original printing of this issue was exhausted in less than a week after its publication.

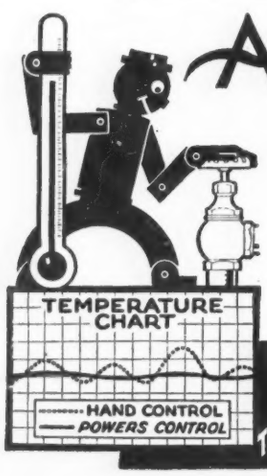
Since, however, we have received a great many requests for extra copies that we have with regret been unable to fill. And, because we dislike to disappoint anyone who may be interested in the worth while information this issue contains, we are planning to reprint the editorial section. But before going ahead we want to ascertain as nearly as possible the approximate number of copies to print.

If you will want any extra copies of this issue—which, according to one reviewer, "...contains information unavailable anywhere else except at an exorbitant cost"—please place your orders as early as possible. Copies of the original edition were sold for $1 each. The planned reprints of the editorial section are priced as follows:

Single Copies, each	$ .50	15 Copies	$6.45
5 Copies	2.40	20 Copies	8.10
10 Copies	4.55	25 Copies	9.50

Larger quantities will be specially priced upon application.

Orders are acceptable for delivery "when, as and if" printed. Address THE PUBLISHER, FOOD INDUSTRIES, 10th Ave. at 36th Street, New York City.

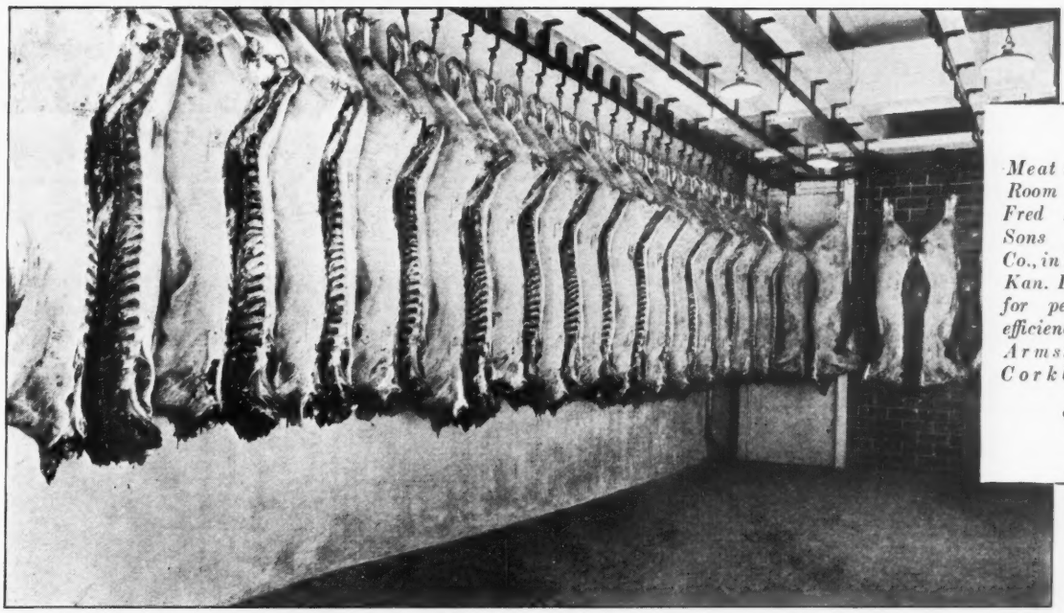


Automatic Temperature Control

TO ERR IS HUMAN—eliminate the errors of hand control of temperature with the mechanical accuracy of a Powers Regulator. It will quickly pay for itself by speeding up production—helps you to get a still better and more uniform product, and stops steam losses due to overheating. Let our engineers study your problems of temperature control and recommend the type of regulator that will give the best results at the lowest cost.

CHICAGO—2755 Greenview Ave. NEW YORK—231 E. 46th St.

THE POWERS REGULATOR CO.
OFFICES IN 40 CITIES
40 YEARS OF SPECIALIZATION IN HEAT CONTROL



Meat Storage Room of the Fred Dold & Sons Packing Co., in Wichita, Kan. Insulated for permanent efficiency with Armstrong's Corkboard.

•

DOLD'S MEAT STAYS FRESH *because of Cork*

For quick-freeze or normal temperatures, cork gives reliable protection

• • •

FROM packing house to pantry, refrigeration is important. And refrigeration depends on insulation. In many food plants, this means Armstrong's Corkboard.

Typical is the meat storage room of Fred Dold & Sons Packing Company, shown here. Like many hundred others throughout the country, it relies on Armstrong's Corkboard for constant temperatures. Today some storage rooms are insulated for the new quick-frozen foods—some for normal cold storage temperatures. But whether the temperature is 30° above or 10° below zero, cork supplies permanent protection against heat loss.

Why is cork the standard insulation for cold storage? There are several reasons, most of them due to the material itself. Cork resists moisture. You may ask what this has to do with refrigeration. Just this: In low temperature work there is always a certain amount of dampness present. If that moisture penetrates the insulation, it ruins the material's efficiency so that it has to be replaced. That's why cork lasts so much longer than materials that can't resist moisture.

Corkboard has low conductivity, which means that it effectively retards the passage of heat. It also has ample structural strength for any kind of installation. Armstrong's Corkboard is easily worked. It does not decay or deteriorate.

Armstrong engineers are at your service in planning low temperature installations of any kind. We would be glad to have you write us for further information or for samples. Just address Armstrong Cork & Insulation Company, 948 Concord Street, Lancaster, Pa.; Canadian offices in Montreal, Toronto, and Winnipeg.

Armstrong's (A) *Product*

Armstrong's Corkboard Insulation

THE STANDARD INSULATION FOR ALL REFRIGERATION

Just Published—

Third Edition — Completely revised

Food Analysis

Typical Methods and the Interpretation of Results

By A. G. WOODMAN

Associate Professor of Chemistry of Foods,
Massachusetts Institute of Technology

557 pages, 5½ x 8, 110 illustrations, $3.50

IN THIS book the author has selected a variety of food materials calculated to illustrate the important methods of attack and the characteristic methods of analysis. Three classes of foods —fats and oils, carbohydrate foods and alcoholic beverages—have been treated at some length; general methods, common to the group, being taken up first in each case, followed by a more detailed discussion of several typical examples. The detection and identification of artificial colors has been treated fully.

In this third edition all data have been brought thoroughly up-to-date. Some of the methods have been changed to conform to the advances initiated by the referees of the Association of Official Agricultural Chemists.

Special emphasis is given to the importance of the interpretation drawn from the results of analysis.

Chapter Headings

1. General Methods. 2. The Microscopical Examination of Foods. 3. Food Colors and Preservatives. Chemical Preservatives. 4. Milk and Cream. 5. Edible Fats and Oils. Olive Oil. Butter. 6. Carbohydrate Foods. Maple Sirup. Honey. 7. Cocoa and Chocolate. 8. Spices. Pepper. Cassia and Cinnamon. Cloves. Mustard. 9. Cider Vinegar. 10 Flavoring Extracts: Extract of Vanilla. Lemon Extract. Extract of Ginger. 11. Alcoholic Foods. Wine. Whiskey.

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Please send me for 10 days' free examination, a copy of Woodman—FOOD ANALYSIS, $3.50 postpaid. I agree to remit for the book, or return it, postpaid, within 10 days.

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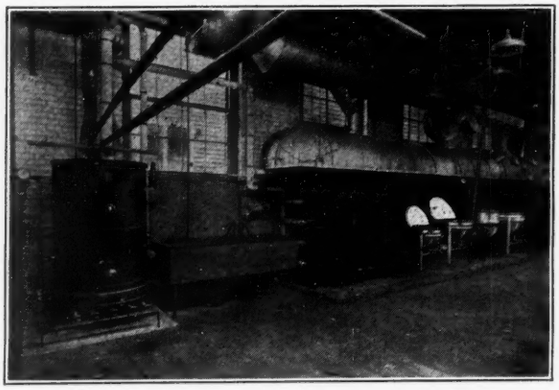
Food 6-31

···four Months Remain—



20-hp. Kane Boiler, Type 8A (one of several installations), supplying steam for heating steam jacketed kettles and vegetable steamer in the commissaries of a large chain restaurant.

in which to Save on 'Summer Steam' for food Processes

KANE

There remain four months when to operate a large heating boiler at low efficiency for Process Steam is simply too costly. By-product steam,—at the best a doubtful economy during the winter,—is definitely bad economy during the summer—

Install an automatic KANE Gas Boiler and save money three ways . . . LABOR, TIME, FUEL . . . these savings, in the aggregate, can be very impressive. One KANE installation used in place of a large coal fired boiler during an 85-day summer season, saved an equivalent of 77.8% return on the initial investment. You can save proportionately by using the KANE!

Stock boilers are built for pressures up to 100 lbs., but special KANES for higher pressures may be had to order. Single or multiple KANE units function equally well. *Get the details now—while a large saving is possible.*

Send for Bulletins!

MEARS-KANE-OFELDT INC.

1903-1915 EAST HAGERT ST. PHILADELPHIA

New York—9 Park Place
Boston—100 Arlington St.
Chicago—325 W. Huron St.
Buffalo—Walbridge Bldg.
St. Louis—2010 Locust Blvd.
Birmingham—Am. Trust Bldg.

GETTING THE "BIG IDEA"

TINY bubbles rising from a tea-kettle—that was all. It had been a common sight to generations of men.

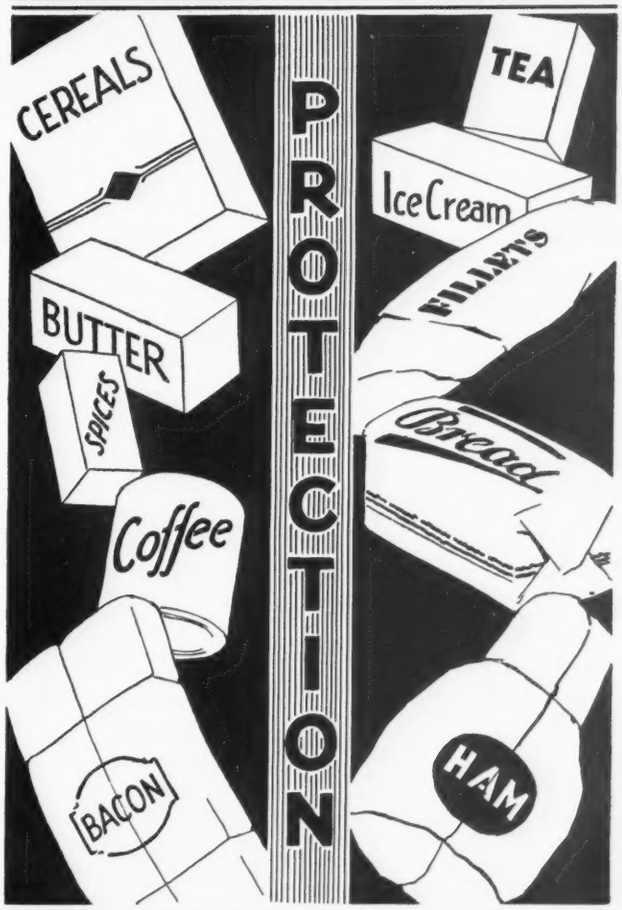
But the vision James Watt saw, in the tiny clouds of steam, the power which should re-make the world — he had the "big idea."

Just so the business of this Company has been built around **Ideas!** Not simply making Paper but developing all its possibilities for the service of the people. On this service has been established the growth and continued success of "The World's Model Paper Mill."

This service is more than a question of the right wrapping; it means full protection for all kinds of food products, under all conditions. Every member of this Company — from the president to the humblest in overalls, is on the alert to find better ways to fulfil present needs and anticipate the new.

KVP Laboratory research experts are at your command; if need arises for some special, exclusive type of protection, do not hesitate to call on us for advice and suggestion.

KALAMAZOO
VEGETABLE PARCHMENT CO.
KALAMAZOO -- MICHIGAN



KVP PROTECTION PAPERS • • •

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or SPECIAL

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

Positions Vacant and all other classifications 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch $6.00
2 to 3 inches..... 4.75 an inch
4 to 7 inches..... 4.50 an inch

Other spaces and contract rates on request.
An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. Food Industries

COPY FOR NEW ADVERTISEMENTS RECEIVED UNTIL 3 P. M. ON THE 24TH FOR THE ISSUE OUT THE 2ND OF THE FOLLOWING MONTH

POSITIONS VACANT

FOOD technologist, chemical training: handle product application research for consulting laboratory; practical experience in sweet food industries preferred. State all relevant details, including compensation desired. P-88, Food Industries, Tenth Ave. at 36th St., New York.

FOREMAN wanted. Nationally known food company desires experienced foreman for evaporated and condensed milk plant. Must have extensive knowledge of evaporated and condensed milk and be able to handle men. Write giving age, experience, salary and reference. P-85, Food Industries, 520 No. Michigan Ave., Chicago, Ill.

WANTED: Chemical engineer, preferably one with experience in manufacture of confectionery and chocolate or allied food products. Please give full information regarding qualifications and salary expected in first letter. P-86, Food Industries, Tenth Ave. at 36th St., New York.

POSITIONS WANTED

CHEMIST, university graduate with experience in the production of beverages, sirups, extracts and compounds, desires position with a reliable manufacturer. PW-80, Food Industries, 520 No. Michigan Ave., Chicago, Ill.

PLANT engineer, ten years' technical and practical training, ability design labor saving machinery, thoroughly experienced maintenance all types production machinery, buildings and equipment. Stationary engineer, refrigeration and electrical licenses. Can produce results economically. PW-89, Food Industries, Tenth Ave. at 36th St., New York.

REPRESENTATIVE AVAILABLE

SALES representative wishes connection in Metropolitan New York territory with company marketing or promoting a food product or one allied to food industry. Has successful record as representative of company manufacturing and distributing chocolate milk beverages through milk and beverage companies. Wide knowledge of and acquaintance in these industries. Age 37 years, and a graduate of Massachusetts Institute of Technology. Broad knowledge of sanitation and public health gained as officer of the U. S. Public Health Service and as municipal health officer. RA-87, Food Industries, Tenth Ave. at 36th St., New York.

BOOKS AND PERIODICALS

WISH to purchase copies Food Industries and other journals. B. Login & Son, Inc., 29 East 21st Street, New York, N. Y.

ACCOUNTS WANTED

of Foreign or Domestic Merchants and Manufacturers who are wanting Ohio representation. We act as contact Agents in this Great Trade Empire. Address

WHOLESALE BROKERS, INC.
Marshall Building, Cleveland, Ohio

COPPER KETTLES

Practically New. All Sizes
50% off of list price
Mfrs. of nickel or copper coils
Copper work and re-tining of all kinds.
—also—
Buyers of used copper equipment.
BRIGHTON COPPER WORKS
2834 Spring Grove, Cincinnati, O.

FOR SALE

SPECIALS

3—W. & P. Mixers, jacketed, 150 gal. Sigma Blades, motor driven.
1—Copper Jacketed Vacuum Pan, 500 gal.; 2—4-ft. 6-in. Milk Vacuum Pans.
4—Shriver 42-in.x42-in. Filter Presses, 40 chambers, pl. and frame, open del.

Send for Latest Bulletins Listing
Rotary and Steam Dryers, Cast Iron, Steel, Copper, and Aluminum Kettles, Retorts, Sweetland Filters, Pony Mixers, Visco Fillers, Clarifiers, Labellers, Bottle Washers, Glass Lined Tanks, Boilers, Pumps, etc.

We pay cash for your idle machinery—One machine or complete plant.
CONSOLIDATED PRODUCTS COMPANY, INC., 13-17 Park Row, New York. Barclay 7-0600

UNION Rebuilt Machinery

ATTRACTIVE PRICES · RELIABILITY · PROMPT DELIVERY

ALL MACHINES RELIABLY GUARANTEED FOR ONE YEAR

Complete Stock
Food Process Machinery

Copper Steam Jacketed Kettles with and without Agitators, capacities 25 to 1000 gallons, tilting and draw offs.
Dough and Food Products Mixers, single and double arm, one barrel to ten barrel capacity.
Vacuum Pans, 50 to 500 gal.
Filter Presses, Tanks, Grinding Mills, Bottle Filling and Pasteurizing Machines, Rotary Steam Dryers, Refrigerating Machines, all sizes.

Union Confectionery Machinery Co., Inc.
318 Lafayette St., New York, N. Y.

NEW AND REBUILT

Buffalo Nut and Food Chopper, motor drive.
Day Clipper Egg Beaters, belt drive.
Double Pan Rack Trucks on casters.
Dough Mixers, single and double arm.
Leonard Date Pitter, motor drive.
Motors, D.C., 230 volt, 15 to 35 hp.
Steam Jacketed Copper Kettles, 10 gal. to 350 gal. capacity, with and without agitators, guaranteed steam pressure.

SAVAGE BROS. CO.
Since 1855—Candy Machinery—Coppersmiths
2638 Gladys Ave., Chicago, Ill.

Special Offerings

in PFAUDLER steam-jacketed TANKS and KETTLES.

also Wood TANKS and CASKS, all kinds. BOTTLERS' MACHINERY, WASHERS and RINSERS, FILLING and CAPPING Machines, PASTEURIZERS and LABELERS, FILTERS and FILTER PRESSES, every size and style, ROTARY STEAM DRYERS.

Write for our large illustrated CATALOG and Price Lists.

UNIVERSAL COMPANY
3625 Superior St., Detroit, Mich.

FOR SALE

Copper Steam Jacketed Kettles, Dough and Food Product Mixers, Bottle Washing Machines, Copper and Glass Lined Tanks, Filters, Filter Presses, Mills, etc.

We also purchase food product equipment. What have you to offer?

Loeb Equipment Co.
618-620 W. Lake St., Chicago, Ill

Assets
Are Better Than
Liabilities

Turn your Used and Surplus Equipment into CASH and make this item a CREDIT instead of a DEBIT

For advertising rates and information Address

SEARCHLIGHT DEPT.
Tenth Ave. at 36th Street
New York, N. Y.

G-15A

PROFESSIONAL SERVICES

FOOD RESEARCH LABORATORIES, INC.

Philip B. Hawk, Ph.D., Director

Investigations in Biochemistry and Nutrition

Food and Medicinal Products Developed, Tested and Standardized

114 East 32nd St. New York

Telephone Ashland 4-5671

FRANK C. GEPHART, Ph.D.

Research and Consulting Chemist

SPECIALIST IN THE CHEMISTRY OF FOOD AND ITS INDUSTRIAL APPLICATIONS SINCE 1906

Products developed, standardized, evaluated. Special problems investigated.

Office and Laboratories
23 East 31st St., New York

T. B. WAGNER

52 Vanderbilt Ave., New York, N. Y.

Consulting Chemical Practice
Chemical and Industrial Engineering

SPECIALIZED SERVICE TO FOOD and MILLING INDUSTRIES:

Developing new products and markets. Enhancing returns from by-products.

Skinner & Sherman

Incorporated

Chemists and Bacteriologists

Analyses, Research, and Consultation on Foodstuffs and Manufacturing Processes.

246 Stuart Street
Boston, Mass.

SCHWARZ LABORATORIES, INC.

An Organization Specializing in Food Chemistry

Analysts, Biologists, Consultants, Engineers

202 East 44th Street
New York, N. Y.
Member Ass'n of Consulting Chemists and Chemical Engineers

Pease Laboratories, Inc.

39-41 West 38th St., New York City

Complete Service to Food Packers Food Preparation, Packing and Processing

Heat Penetration Determinations Nutritional, Chemical and Bacteriological Research

Dr. HENRY ARNSTEIN

191 E. Roosevelt Boulevard
PHILADELPHIA, PA.

Specialists in the utilization of natural resources, the elimination of waste and the recovery of by-products. Complete chemical and food producing plants constructed and operated. Technical advisor to the governments of Argentina, Brazil, Colombia, Cuba, etc.

VALUE

There is value in consulting this Directory when in need of Professional assistance.

LLOYD A. HALL

Consulting Chemist

Specializing in the Food Industries

Food, Pharmaceutical, Bacteriological and General Industrial Process investigations. Advice in patent matters. Chemical analyses and research.

Consultation and expert testimony.

1415 West 37th Street, Chicago, Ill.

PHILIP O. GRAVELLE

PHOTOMICROGRAPHS FOR INDUSTRY

Technical and Scientific Photographs made through the microscope, for the comparison of materials.

GRAVELLE PHOTOMICROGRAPHS

For Research, Development, Control and Advertising.

114 Prospect St., South Orange, N. J.
Telephone South Orange 2-2791

SW&Co
A NATIONAL ORGANIZATION FOR CONSTRUCTIVE SERVICE

Scovell, Wellington and Company

ACCOUNTANTS and AUDITORS

MANAGEMENT ENGINEERS

10 East 40th Street, New York

CLEVELAND SYRACUSE SPRINGFIELD
KANSAS CITY SAN FRANCISCO
BOSTON PHILADELPHIA CHICAGO

THE CONNECTING LINK

The primary aim of our service is to increase sales for food manufacturers and purveyors of basic food materials. We combine modern laboratory and factory science in the development of new and improved products. We render a complete merchandising service to promote distribution in the trades. Restricted clientele includes nationally known Aal concerns; only non-competing lines accepted.

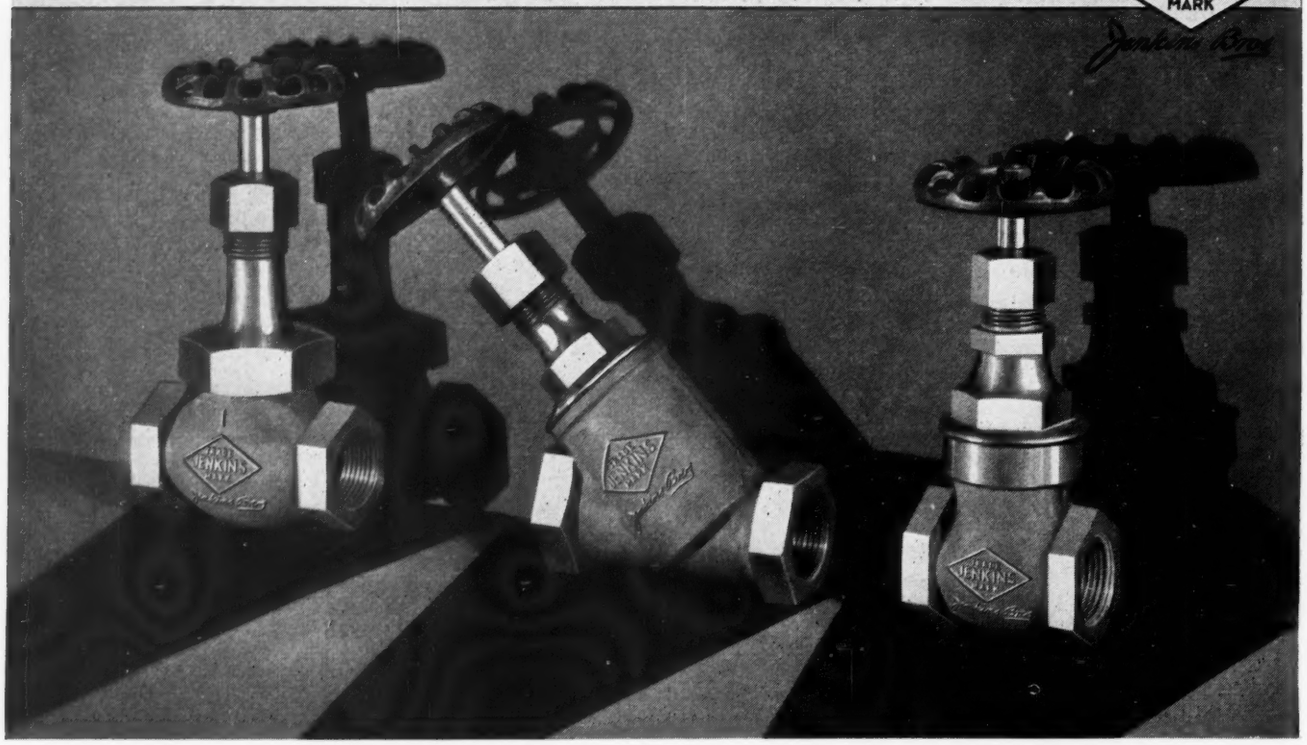
Write or telephone for appointment at our office or yours.

A. A. LUND & ASSOCIATES
303 West 42nd Street, New York
Telephone, Lackawanna 4-7845

YOUR card here builds prestige and helps to make your name familiar in the field. The cost is extremely small in proportion to its value as a business aid.

Jenkins VALVES ARE ALWAYS MARKED WITH THE "DIAMOND"

TRADE JENKINS MARK



Left to right: Fig. 106-A Jenkins Standard Bronze Globe Valve with one-piece screw-over bonnet and slip-on stay-on disc holder. Fig. 124 Jenkins Standard Bronze Y or Blow-off Valve; and Fig. 370 Jenkins Standard Bronze Gate Valve.

You can *see* Jenkins quality . . . you can *count* on Jenkins performance

A Jenkins Bronze Valve is beautifully proportioned. Heavier, too, it is built with extra metal. You can tell this just by holding a Jenkins in the hand.

But don't stop there. Take a Jenkins apart. Examine it thoroughly. If you do, you can immediately see and sense the care with which it is made. Quality is evident in every part; in the deep stuffing box, sturdy manganese bronze spindle, strong clean-cut threads.

Jenkins quality tells its own story. It wins and retains the user's confidence. At a glance you know you can count on Jenkins for good performance in plumbing, heating, fire protection, power plant, and equipment piping.

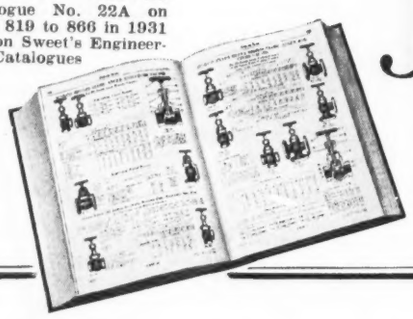
Your supply house can furnish Jenkins in types and sizes for all services.

JENKINS BROS.

80 White Street, New York, N. Y. | 133 No. Seventh St., Philadelphia, Pa. | 524 Atlantic Ave., Boston, Mass. | 646 Washington Blvd., Chicago, Ill. | 1121 No. San Jacinto, Houston, Texas

JENKINS BROS., Limited, Montreal, Canada; London, England
Factories: Bridgeport, Conn., Elizabeth, N. J.; Montreal, Canada

See the complete Jenkins BOOK OF VALVES Catalogue No. 22A on pages 819 to 866 in 1931 Edition Sweet's Engineering Catalogues



Jenkins

BRONZE IRON STEEL

VALVES

Since 1864

Your fresh meat would still bellow down Main Street...

IF IT WEREN'T FOR REFRIGERATION

● The steaks, chops and roasts of pre-Civil War days went to market on the hoof. Herds of cattle clattered up New York's Wall Street...stopped traffic on Fifth Avenue. Philadelphia saw parades of beribboned beeves on High Street. And, unless you lived around the corner from a slaughter-house, you ate your meat salted, pickled, or dried.

Spurred by the food problems of the Civil War, American packers began using ice. That started a far-reaching revolution... an ever-increasing use of refrigeration. Finally, in the nineties, came those huge central packing plants, which were literally designed around refrigerating machines. It was at this point that York began its service to the packing industry.

Today, there is an almost unbelievable chain of refrigeration from the refrigerated packing plants to every corner of the country... refrigerated railroad cars, refrigerated warehouses, refrigerated meat markets. The refrigerated space behind this service (packers alone) would fill 39 city blocks solid with five-story buildings. Chicago's stockyard district itself uses 16,000 tons of refrigeration daily.

Today, your table chooses between Jersey pork and Texas beef, Long Island ducks and Iowa chickens. You accept nothing from your meat market but primé, sweet meat. You pay nothing extra for this luxury.

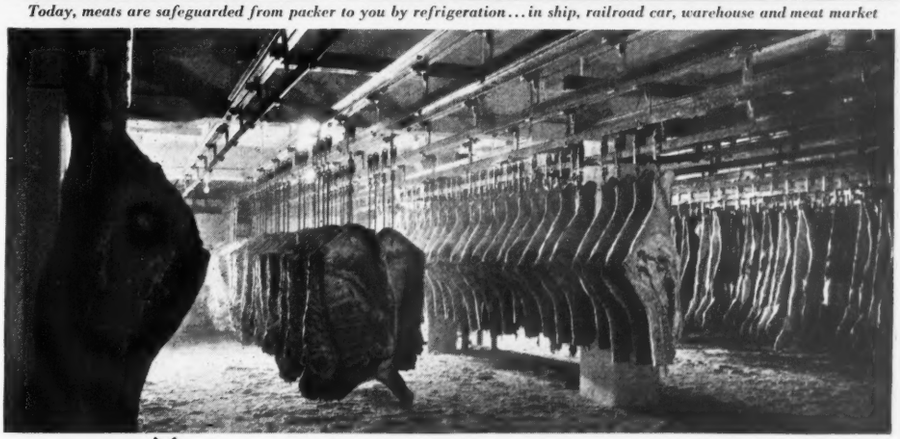
Tomorrow ? ? ?

The curtain is just now lifting on new methods of meat merchandising intended to bring even greater convenience to the public. In this march of progress, refrigeration plays the dominant part and York research, experience and technical skill go hand in hand with every progressive development.

It is a truly extraordinary background that York brings to the solution of refrigeration problems.

YORK ICE MACHINERY CORPORATION
• • YORK • PENNSYLVANIA • •

Today, meats are safeguarded from packer to you by refrigeration... in ship, railroad car, warehouse and meat market



INDUSTRIAL REFRIGERATION DIVISION
Refrigeration specifically applied to every industrial need.

COMMERCIAL UNIT DIVISION
Self-contained refrigerating units for meat markets, groceries, delicatessens, florists, restaurants, hotels, hospitals.

EXPORT DIVISION
Adapts to varying needs of export markets, products and services of the other divisions. General Export Office, New York. Cable: Shipleuma, N. Y.

AIR CONDITIONING DIVISION
Complete air conditioning systems for maintaining proper atmospheric conditions for comfort and industrial purposes.

ICE PLANT DIVISION
Ice making machinery and ice plant equipment . . . a complete service to the ice industry.

ICE CREAM AND MILK PLANT DIVISION
Refrigerating machinery and specialized equipment for ice cream making, dairies and milk products.

ACCESSORY AND SUPPLY DIVISION
Refrigerating lubricants, supplies, fittings, accessories.

MARINE DIVISION
Equipment and engineering for all marine refrigerating requirements.

SERVICE AND MAINTENANCE DIVISION
Engineering service obtainable from 71 direct factory branches in the U. S. A. and 20 foreign cities.

YORK
REFRIGERATION

In these Saturday Evening Post advertisements York tells the public how important refrigeration in industry is to daily life. In this case the packing industry is featured.

Thanks
FROM MIKE*

. . . . . Thanks for orders.

. . . . . Thanks to the many people who came in to see us at the Show, and asked us to prove what MIKE can do.

Maybe you didn't meet MIKE there. Perhaps you mislaid our catalog. In any case you can still have it by just mailing the coupon.

Get MIKE'S story today and learn how users are saving thousands of dollars annually in their pulverizing costs.

Some nationally known users . . .

Ambrosia Chocolate Company
American Sugar Refining Co.
Battle Creek Food Company
Bachman Chocolate Mfg. Co.
Borden Company
Bowey's Inc.
California Milk Products Co.
Adolph Coors Company
Crown Fruit and Extract Co.
Dextora Company
Dugan Bros., Inc.
First National Stores
Frank H. Fleer Corp.
D. Ghirardelli Co., Inc.
Hershey Chocolate Corp.
H. Kohnstamm and Co., Inc.
Kraft-Phenix Cheese Corp.
Langendorf United Bakeries, Inc.
Loose-Wiles Biscuit Co.
Mead-Johnson and Co.
National Biscuit Co.
Nestlé's Food Company
Rockwood and Company
Runkel Bros., Inc.
Siren Mills Corp.
Wm. J. Stange Company
Standard Brands, Inc.
Toddy, Inc.
United Fruit Co.
Walgreen Company
Warner Jenkinson Co.

PULVERIZING MACHINERY CO.
30 Church St., New York City

MIKE*—(MIKRO-PULVERIZER) . . . *the modern machine for pulverizing XXXX sugar and other commodities to similar fineness.*

PULVERIZING MACHINERY CO.
30 Church St., New York City

Gentlemen:

Please send me the new booklet by "Mike." It is understood that this request incurs no obligation.

Name.....

Position.....

Company.....

Address.....

ALPHABETICAL INDEX
• TO ADVERTISERS •

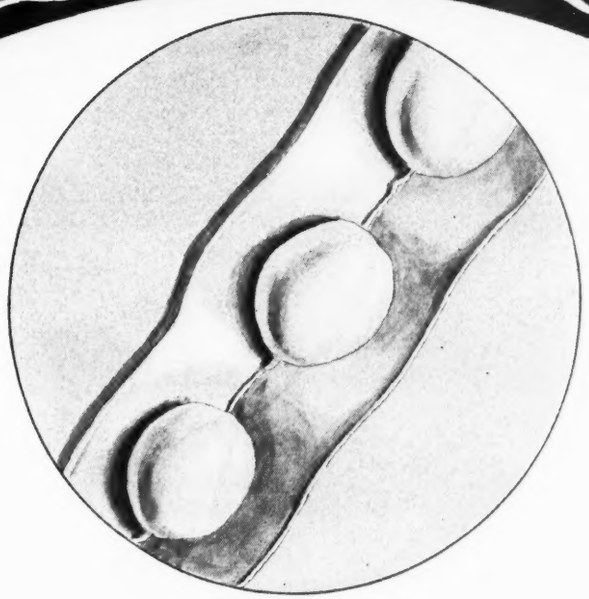
This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Food Industries* assumes no responsibility for errors or omissions.

	Page
Allegheny Steel Co.	Back Cover
Allis-Chalmers Co.	29
American Air Filter Co.	41
American Can Company	20
American Gas Ass'n.	26
American Sheet & Tin Plate Co.	Insert 37-38
American Steel & Wire Co.	Insert 37-38
Armstrong Cork & Insulation Co.	47
Associated Cooperage Industries of America	5
Austin Company	23
Bausch & Lomb Optical Co.	9
Bowen Research Corp.	31
Buffalo Forge Co.	8
Carnegie Steel Co.	Insert 37-38
Carrier-York Corporation	27
Century Electric Co.	34
Cheeseman-Elliott Co.	42
Chemical Catalog Co.	32
Cherry-Burrell Co.	44
Clipper Belt Lacer Co.	25
Diamond Crystal Salt Co.	2d Cover
Dodge Brothers	15
Drehmann Paving & Construction Co.	42
Ferguson Co., J. L.	13
Firestone Tire & Rubber Co.	21
Fulton Sylphon Co.	45
General Electric Co.	17
Harnischfeger Corp.	35
Illinois Steel Co.	Insert 37-38
Innis, Speiden & Co.	46
International Nickel Co.	16
Jenkins Bros.	52
Kalamazoo Vegetable Parchment Co.	49
Kelvinator Corporation	10
Lamson Company	30
McGraw-Hill Book Co.	48
Mears-Kane Ofeldt, Inc.	48
Meyercord Co.	Insert 11-12
Morse Chain Co.	40
National Tube Co.	Insert 37-38
Niagara Blower Co.	31
Oakite Products, Inc.	40
Package Machinery Company	18
Perfection Mfg. Co.	39
Pneumatic Scale Corp., Ltd.	4
Powers Regulator Co.	46
Pressed Steel Tank Co.	28
Professional Service	51
Pulverizing Machinery Co.	54
Reo Motor Car Co.	22
Republic Steel Corp.	33
Robinson Mfg. Co.	36
Sarco Company, Inc.	39
Searchlight Section	50
Sharples Speciality Co.	20
Shriver & Co., T.	40
Sprague-Sells Corp.	32
Standard Conveyor Co.	14
Street Railways Adv. Co.	6-7
Tagliabue Mfg. Co., C. J.	46
Taylor Instrument Companies	3d Cover
Union Tank & Pipe Co.	24
Viking Pump Company	24
Worthington Pump & Machinery Corp.	43
York Ice Machinery Corp.	53

SEARCHLIGHT SECTION
Classified Advertising

ACCOUNTS WANTED	50
BUSINESS OPPORTUNITIES	50
EMPLOYMENT	50
USED AND SURPLUS EQUIPT	
Brighton Copper Works	50
Consolidated Products Co.	50
Loeb Equipment Co.	50
Union Confectionery Mchy. Co.	50
Universal Co.	50
PROFESSIONAL SERVICES	51

Write to the Equipment Information Bureau of FOOD INDUSTRIES *for "where-to-buy" data on any products on which you would like further details.*



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JUN 9 1931
CINCINNATI STATION

Like peas in a pod . . . .

ALL *Tycos* CONTROLLED BATCHES ARE UNIFORM

USE *Tycos* CONTROL . . . . . .USE *Tycos* CONTROL

Maintaining constant cooking temperatures and uniform results is next to impossible without accurate instrument-control. If you don't believe it, put a *Tycos* Recording Thermometer on a cooking kettle. Don't look at it until the batch is emptied. The wavy, erratic line on the *Tycos* chart will tell its own story of cooking inefficiency. Now install complete *Tycos* Control and forget about the batch. The *Tycos* system keeps a record, yes, but far more important it *controls the temperature* and time so that every batch is identical. It eliminates watching, guesswork, labor and waste.

Tycos

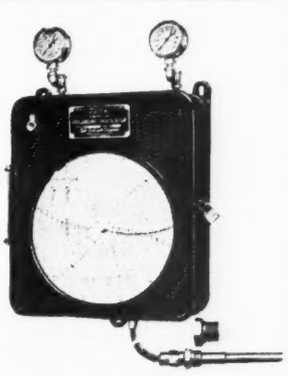
The preliminary processes of blanching and exhausting are also important and should have proper temperature control.

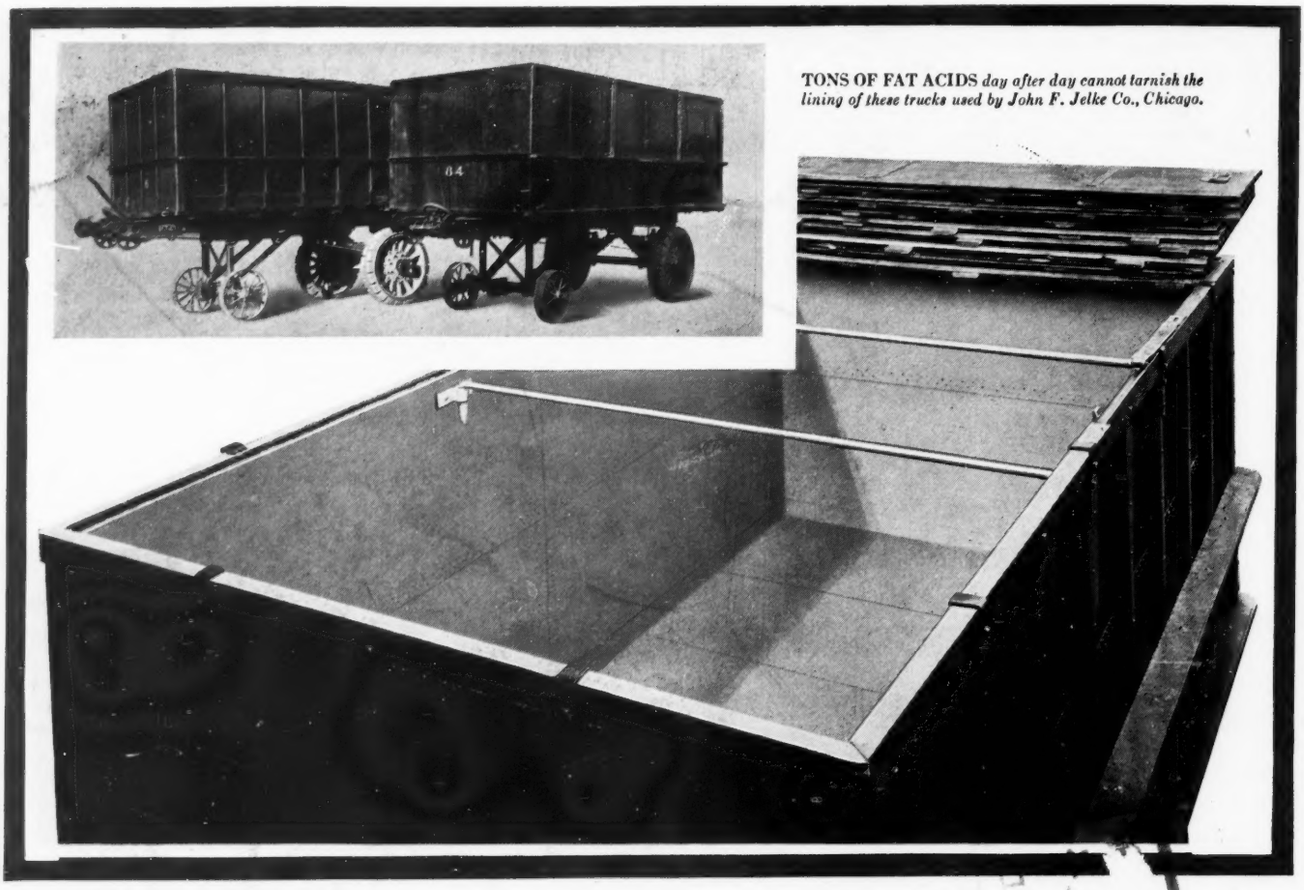
A new Canner's Catalog, Part 500 is just off the press. May we send a copy?

Taylor Instrument Companies

Rochester, N. Y., U. S. A.

New York	Indianapolis
Chicago	San Francisco
Boston	St. Louis
Philadelphia	Cincinnati
Pittsburgh	Tulsa
Cleveland	Detroit
Los Angeles	Atlanta
Minneapolis	





TONS OF FAT ACIDS *day after day cannot tarnish the lining of these trucks used by John F. Jelke Co., Chicago.*

SOME DAY you'll use Allegheny Metal

Allegheny METAL

RECEIVED JUN - 4 1931

QUICK FACTS

1. *Resists more corrosive agents than any other alloy.*
2. *Can be drawn, stamped, machined, spun, cast, forged.*
3. *Far stronger than mild steel.*
4. *Will take any finish from dull to mirror.*
5. *Is non-magnetic.*
6. *Resists denting and abrasion.*
7. *Is readily annealed; may be welded and soldered.*
8. *Is produced in practically all commercial forms.*

Manufactured pursuant to license from the Chemical Foundation, Inc., owner of Electric Alloy Patents No. 1,316,817 and No. 1,339,378.

INSPECTED RECEIVED JUN 8 - 1931

Its insolubility makes it the safe alloy for all contact with food products.

NO matter what you may test or try—some day you'll use Allegheny Metal.

We've seen it work in many cases. Manufacturers of mayonnaise, fruit juices, cheese, cereals and hundreds of other products are swinging to Allegheny Metal because they know it's *safe*. It's insoluble in food acids, and this insolubility is your protection against any taint that might render your product unsalable.

Further, Allegheny Metal is far stronger than mild steel. It has strength to support itself and a heavy batch, too. Yet it's lighter in weight than most metal now used. It's non-magnetic. It cleans as easily as glass.

Again—some day you'll use Allegheny Metal. The greater your corrosion problem—the sooner it will be. Some of your friends are probably using it already. Ask their opinion of it. Specify it in your next order for equipment.

ALLEGHENY STEEL COMPANY, Brackenridge, Pa.

Offices: New York, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Philadelphia, St. Louis, Milwaukee, Los Angeles. *Warehouse Stocks:* Joseph T. Ryerson & Son, Inc.—Chicago, Cleveland, Milwaukee, St. Louis, Cincinnati, Detroit, Buffalo, Boston, Jersey City, Philadelphia . . . *In Canada:* Samuel, Son & Co., Ltd., Toronto.

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ALLEGHENY